The Agouti

[*Dasyprocta leporina, D. aguti*]

Booklet and Producers' Manual

Roxann C. Brown-Uddenberg
Gary W. Garcia
Quinn S. Baptiste
Terrence Counand
Andrew O. Adogwa
Terry Sampson

St. Augustine, Trinidad
Trinidad and Tobago
2004

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Booklet and Producers' Manual,
First Edition, GWG Publications,
Trinidad and Tobago, West Indies

ISBN 976-95123-0-3

First Edition Published by
GWG Publications
24 Sagan Drive, Champs Fleurs, Trinidad
Trinidad and Tobago, West Indies

ISBN 976-95123-0-3

Printed by TRINPAD DIRECT LIMITED,
Marabella, Trinidad and Tobago, W.I.

Cover Design by Nirmala Ganessingh and inside cover photograph by Gary Wayne Garcia.

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Wildlife Farmers' and Producers' Booklet #1:
The Open Tropical Forage-Animal Production Laboratory
[OTF-APL]

Department of Food Production
Faculty of Science and Agriculture
The University of the West Indies
St Augustine, Trinidad, Trinidad and Tobago, W.I.

Professor Richard A. I. Brathwaite
Head of Department

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Roxann C. Brown-Uddenberg[1]
Gary W. Garcia[2]
Quinn S. Baptiste[1]
Terrence Counand[1]
Andrew O. Adogwa[3]
Terry Sampson[4]

[1] Graduates, The Open Tropical Forage-Animal Production Laboratory
[OTF-APL],
Department of Food Production, Faculty of Science and Agriculture
The University of the West Indies, St. Augustine, Trinidad, Trinidad and Tobago West Indies

[2] Co-ordinator, The Open Tropical Forage-Animal Production Laboratory
[OTF-APL] & Senior Lecturer in Animal Production
Department of Food Production, Faculty of Science and Agriculture,
The University of the West Indies, St. Augustine, Trinidad, Trinidad and Tobago, West Indies
e-mail: garygwg1@yahoo.com

[3] Senior Lecturer in Anatomy, School of Veterinary Medicine
Faculty of Medical Sciences, The University of the West Indies, Mount Hope
Trinidad, Trinidad and Tobago, West Indies

[4] Technical Assistant, Department of Agricultural Extension and Economics
Faculty of Science and Agriculture, The University of the West Indies
St. Augustine, Trinidad, Trinidad and Tobago, West Indies

DEDICATION

To all Agouti Lovers,
Producers and Consumers,
past, present and future

ACKNOWLEDGEMENTS

Special acknowledgement must be given to Mr. Shamjeet Singh, who travelled throughout Trinidad to assist in the collection of the Agoutis. In addition we must also thank the following: Miss. Joanne Biswah, Mrs. Doolarie Bachue, Mr. Patrick Ragoo, and Mr. Alexander Benn, all at the UWI University Field Station, Valsayn, Trinidad, Trinidad and Tobago. In the Department of Food Production [DFP] we would also like to thank Miss Gail Young for help in feeding the Agouti on weekends and for all the support she has given us over the years in many different ways, Mrs Maxwell, Miss Andrea Houston and Miss Deniece Bishop for their Administrative and Secretarial support and Dr Richard Brathwaite for his support as Department Head. We would also like to thank Mr. Cicero Lallo and Dr Gregory Bourne for their enlightening discussions and Mr Romano Mac farlane for assistance with the feeding of the Animals in the Experimental Unit on weekends. Special acknowledgement must also be given to Dr. Gabriel Brown, Dr. Nicole Lambie and Dr. Selene Warren from the School of Veterinary Medicine, Faculty of Medical Sciences, The University of the West Indies, Mount Hope. Recognition must also be given to the institutions, which helped and these included the staff at the Emperor Valley Zoo, Port of Spain and the Wildlife Section of the Forestry Division of the Ministry of Agriculture, Land and Marine Resources [now within the Ministry of Works and the Environment] of Trinidad and Tobago for the Agoutis, their data, their time, co-operation and their experience, which they shared freely with us, in particular Dr Carol James, Mr. Kirk Amour and Mr. Dave Samayah. Also we would like to thank all those "Wildlife Farmers" who shared their knowledge, animals and experience with us. Additionally we must also thank Mike Morgan [Office of Public Affairs], the staff of the Small Mammal Unit and the Library of the National Zoo [Washington DC], and Mark Rosenthal and the staff of the Lincoln Park Zoo, Chicago for their assistance and information. We would also like to thank Mr. Michael Ramrattan who shared freely with us his facilities, ideas and his invention on some practical agouti restraining techniques. He must also be thanked for his useful comments on the booklet. Also to be thanked is Mr Narine Lackhan, former Conservator of Forests of Trinidad and Tobago for his incisive comments on the draft. Thanks must also go to Mrs. Yasmin Comeau, Curator of the National Herbarium of Trinidad and Tobago, for her help in getting the accuracy of the scientific names of the plants referred to in Table 11. Formal acknowledgements must also be extended to the University of the West Indies and the Inter American Foundation Development Studies Fellowship, University of the West Indies, Office of Planning and Programming, The Vice Chancellery, Mona, Kingston 7, Jamaica, West Indies, as their financial assistance (a grant of US$2000) was used to build the cages for the Agouti experimental unit at the UWI University Field Station. In addition we must thank Miss. Nirmala Ganessingh for assisting with the preparation of the print ready layout. Finally our deepest gratitude must go to Mrs. Wendy Lee Yuen, President of The Agricultural Society of Trinidad and Tobago, for endorsing this publication.

FOREWORD

Until quite recently Wildlife development in the Commonwealth Caribbean (or CARICOM Region) has not been given the attention it deserves, probably because most of the member countries of the region are Small Island States (SIS). Guyana on the South American mainland is a relatively large CARICOM country with extensive tropical forests and many indigenous tropical Wildlife species are found there. Also, in Dominica which is one of the larger more mountainous and forested of the SIS and in Jamaica and Trinidad and Tobago useful non-domestic Wildlife species are present. Some of these species are being threatened at the present time and a few are felt to be endangered.

The potential for Wildlife farming has existed for a long time, but only fairly recently has there been an interest in such activity although some prospective Wildlife farmers have reared these animals in captivity on a hobby basis. In Trinidad and Tobago with the encouragement of an FAO expert a **Wildlife Breeders and Farmers Association of Trinidad and Tobago** was formed as early as 1984.

It is a distinct credit to The **University of the West Indies (UWI) Faculty of Agriculture and Natural Sciences** (as it then was) that under the leadership of Dr Gary W. Garcia, Senior Lecturer in Animal Production in the Department of Food Production, the move was made to extend animal production teaching and research at the Post Graduate level to include Wildlife production and management through an **Elective Course (AL65B) entitled: "Zoo and Wildlife Production and Management"** in the **M.Sc Degree** of the **TROPICAL ANIMAL SCIENCE AND PRODUCTION** Programme. This development provided the dynamic to promote Wildlife production and farming in a scientific way, and has allowed for the establishment of strong linkages with Zoo and Wildlife specialists in North America and Europe. With the inclusion of such a programme within The University (UWI) has come the demand for Producers and Farmers Manuals on selected Wildlife species. It is therefore not surprising that the first manual, in what it is hoped will be a Series of Wildlife, was **the Agouti (*Dasyprocta leporina*)**.

This Booklet entitled**: The Agouti (*Dasyprocta leporina, D. aguti*) Booklet & Producers' Manual** has been ably put together by a Team of six (6) scientists, led by Ms Roxann C. Brown-Uddenberg, the first author, whose research investigated the Agouti species. The Team includes the Leader (Dr Gary W. Garcia), Dr Andrew Adogwa, Senior Lecturer in Anatomy in the School of Veterinary Medicine of the UWI Faculty of Medical Sciences, other Graduate students and a Technical Assistant. The Booklet sets about to place the Agouti, one of Trinidad's principal Wildlife species and also a key Wildlife species of the New World, into perspective especially as it is one of the animal species under threat by human and biotic factors as well as pollution and micro-climatic changes. The manual also includes Questions of an eight year old school girl to describe the animal in simple terms. Then, it reviews the scientific information related to the Agouti species covering its physical ap-

pearance, morphological features, health and diseases, feeding and nutrition, reproductive systems of the Male and Female of the species, their reproductive patterns, habitats, housing, social behavior, and provides haematological and serum information on the species. The final section of the Booklet outlines in clear detail the process of setting up an intensive **Agouti Production System** including the key technical coefficients and other information obtained from actual experience in the **Intensive Agouti Production Unit** operated by the Open Tropical Forage-Animal Production Laboratory (OTF-APL) at The UWI in Trinidad, West Indies. The background to **The Agouti Production Model** is outlined for the benefit of prospective Agouti producers and farmers in order to empower them to develop and improve it**.** A **Glossary of Terms** is also provided, and a List of **References** is given. Areas for further research on the Agouti are also suggested. The Booklet has a page at the back that may be completed and sent to the Authors with comments and suggestions to improve the Manual.

This Booklet is designed mainly to assist prospective Agouti farmers/producers, but it will also be invaluable to students, researchers, Zookeepers, planners, ecotourism operators and conservationists in focusing on the key requirements for the successful rearing and production of Agouti. The Booklet can be applied to the other Rodent Wildlife species in the absence of a specific Manual. Through this Booklet, it is hoped that the Agouti and other non- domestic Wildlife species may be humanely treated, their environment maintained and better conserved and their productivity made more efficient so that the threats to the existence of the Agouti can be minimized. It is also hoped that a Series of such Producers and Farmers Manuals might be produced, and include other Wildlife species from the Rodent, Reptile, Ruminants, Avian, Feline, Marsupial and Suiforme Groups with a Manual on the Capybara (***Hydrochoerus hydrochaeris***) following next in the Series.

Dr Keith A.E. Archibald
Chairman, Board of Directors
Caribbean Agricultural Research and Development Institute (CARDI)
UWI Campus, St Augustine
Trinidad, Trinidad and Tobago, West Indies

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INTRODUCTION AND HOW TO USE THIS BOOKLET

The Purpose of this booklet….

This booklet arose out of the Post Graduate research work of the first author [Roxann Brown-Uddenberg]. This was complemented by the classroom experience of the course **"AL65B: Tropical Zoo and Wildlife Production and Management"** that has been offered since 1997 by the second author [Dr Gary Wayne Garcia] with support from Professor Stanley Temple [of the University of Wisconsin-Madison] and Mr. Howard Nelson [his Ph.D. student and formerly the Wildlife Biologist, Ministry of the Environment, Republic of Trinidad and Tobago]. This course is a Graduate Elective in the **M.Sc. in Tropical Animal Science and Production** programme of the Department of Food Production, Faculty of Science and Agriculture (formerly known as The Imperial College of Tropical Agriculture [ICTA] from 1921 to 1960, and The Faculty of Agriculture from 1960 to 1996), The University of the West Indies, St Augustine, Trinidad and Tobago.

Surveys conducted in 1994 suggested that there was interest in the Agouti. Eighty-five percent (85%) of the wildlife farmers surveyed in Trinidad reared the Agouti but had no or little information on the production of this species (Brown *et al* 1997). In 2000 the database on 115 wildlife farmers also revealed a similar situation. In the classroom as well it was also realized that students were interested in the Agouti but did not have the type of information needed to develop a predictable production system. In Trinidad and Tobago some writings, however, have been done on the Agouti by Ramdial and Ramdial (1974), Hislop (undated) as cited by Asibey (1984), Asibey (1984), Miller and Miller (1986), Hislop (1987, 1989) and Boodoo and Elliotte (1992). These authors have provided us with the foundation upon which we were able to proceed. This has been complemented by our production research and the varied experiences that have been shared with us by the many wildlife farmers in Trinidad and Tobago, and by Zookeepers from Trinidad, The United States, The United Kingdom, Venezuela, Germany and Austria. This booklet has been produced with the following intentions:

1] to outline the reasons why we think that the Agouti in Trinidad and Tobago is being threatened,
2] to be able to quickly answer some of the simple questions on the Agouti, this we call "Aryann's Questions" which were the questions that a nine year old girl [Aryann Garcia] asked about the animal,
3] to provide the justification for the captive rearing of the Agouti in Trinidad and Tobago, and the Neo-Tropics at large,
4] to be able to provide the scientific information on the animal to existing Agouti lovers, hunters and farmers and
5] to be able to provide a framework and production plans for an intensive production model for this animal either for hobby or commercial production.

The booklet is therefore organized in a manner that we hope you would enjoy.

How could you use this booklet?

This booklet is made up of four (4) parts as follows:

1. **Description of threats to wildlife and wildlife farming in Trinidad and Tobago,**
2. **Aryann's Questions on the Agouti,**
3. **A Scientific Literature Review on the Agouti and the genus *Dasyprocta* and**
4. **A Practical Guide for Agouti Production.**

Aryann's Questions could be used by Primary and Secondary school teachers to answer the basic questions on the Agouti. This could be copied for circulation to students.

The third part contains all the scientific information on the Agouti and can be used as a reference on the Agouti.

The fourth part contains the information on how you could go about setting up an intensive Agouti production unit and is designed to be a practical production guide aimed at informing farmers, hunters and the general public.

Part 1

Threats to Wildlife and Wildlife Farming in Trinidad and Tobago

THREATS TO THE AGOUTI IN GENERAL AND WITH SPECIFIC REFERENCE TO A SMALL ISLAND STATE: TRINIDAD AND TOBAGO, WI.

The Agouti like most other wildlife species in Trinidad and Tobago [and in many other small island states of the New World] are being threatened or endangered for the following reasons: Human/ Biotic Factors, Pollution and Micro-Climatic changes.

1] Human/Biotic Factors

As human populations increase so does the need for additional housing settlements. These settlements gradually encroach on the natural forests and bush-land areas leading to the degradation of the natural habitat of the wild animals. The forested areas where these animals make their home is not only threatened by the clearing of land for the construction of housing, but also from the building of motorways and access roads which fragments these animals natural habitat.

In many small island states the aim to become self-sufficient in food. This has led to more land being devoted to agriculture where new areas are being rapidly developed in an attempt to supply these countries with the additional food requirements. Additionally, the removal of timber from the forests and forest fires have created less obstacles for hunters and has also led to habitat destruction.

Other major causes for the decline in the number of Agouti are over-hunting and indiscriminate killing. Some hunters disregard the illegality of hunting in the closed season and kill animals that may be potentially fertile or pregnant. This is compounded by the willingness of members of the society to support the trade.

2] Pollution

When the human population disposes of refuse using unsanitary or environmentally hazardous methods, there are negative effects on preservation of all wild animals. This could result in changes in the animals' habitat or could predispose them to illness.

3] Micro-Climatic Changes

Micro-climatic changes due to natural or man made involvement have impacted negatively on the survival of the wildlife.

SUMMARY OF ALTERNATIVE SOLUTIONS

In an effort to halt the decline of the wildlife population, several solutions are being suggested and these are as follows:

1. Enforcement of the Land Use Zoning Laws.
2. Enforcement of the Wildlife Conservation Laws with increased penalties.
3. Enactment of new Pollution laws.
4. Establishment of Wildlife Emergency Relief Centres.
5. Education of the population, and
6. Establishment of Captive Breeding Centres/ the Empowering of Farmers to produce wildlife and in particular, the Agouti.

1] Enforcement of the Land Use Zoning Laws

There are enacted laws that have prescribed land use in order to preserve the natural habitat of many species of wildlife. These laws have not always been enforced. Unless the situation changes land use zoning will continue to be problematic and not be of any real benefit to conservation.

2] Enforcement of Wildlife Conservation Laws

In some small island states there is incorporated into the wildlife laws protection for all wildlife against hunting. In Trinidad and Tobago the Agouti needs special attention because of its potentially threatened status. The enforcement of these laws is weak, while the monetary rewards after breaking these laws are high. There is therefore the need for higher monetary penalties accompanied by long terms of penal punishment for the lawbreakers.

3] Enactment of New Pollution Laws

The enactment of new pollution laws with an emphasis on industrial disposal of waste, is critically needed in many countries. Excessive penalties, including permanent closure of the industry should be introduced to deter the indiscriminate dumping of effluent into water sources. Additionally, the burning of waste that causes air pollution should be included in these laws. However, in the legislative process, there is the human element, which too often is easily compromised.

4] Establishment of Wildlife Emergency Relief Centres

Wildlife emergency relief centres, once developed, can assist in the protection and rehabilitation of wildlife. These centres would be established in populated areas near to forests to allow the retrievers easy access. Their services would include a mobile unit to recover wildlife from homes, disaster areas and young, orphaned by hunters. The rehabilitation centre could act as the repository. This solution is costly and the human element poses the threat of compromise.

5] Education of the Population

Public education with special emphasis on hunters, is an existing program, unfortunately this has had minimum impact on the general trends. Ignorance by the status quo of the Agouti and other wildlife species and the monetary gains associated with the wildlife trade has rendered the education of commercial hunters invalid. However this booklet hopes to contribute to this effort.

6] Establishment of Captive Breeding Centres/ the Empowering Farmers to produce Agouti

The establishment of captive breeding centres where young adult male and female animals will be housed, is the recommendation of choice, for several reasons. ***This was recommended by Hislop (1989) a long time ago!!!.*** Firstly, this would lend itself to intensive production. Secondly the centres will provide protection and a healthy environment for reproduction. Thirdly, these centers could be used as breeding facilities aimed at selection for improving the performance of the Agouti stock.

Because the centres could be housed at stations that are already established and associated with the conservation, protection and reproduction of wildlife, such as the Emperor Valley Zoo and the OTF-APL [in Trinidad and Tobago], trained staff will be available to address medical and behavioral concerns. This is the role in conservation approach that zoos could take. These centres will also act as relief centres for orphaned and traumatised animals, so rehabilitation and restoration of the animals can be handled in a proper manner with security measures already in existence. This type of facility will ensure that the threat of human compromise is avoided through the existing security measures at the Zoo.

Additionally private persons and farmers could be encouraged to produce and manage the Agouti commercially, thereby decreasing the dependence on the wild. Some farmers are already doing so (Picture 1). The establishment of the first captive breeding centre could be constructed under the umbrella of The OTF-APL and a Zoo. This could become the blueprint for the other centres throughout the country where State institutions exist. This will provide the animals with professional health care by trained staff and security from attack by hunters through the security mechanisms, already established at the Zoo.

Some Species with the potential for Wildlife Farming

Captive bred stock will prevent the possible extinction of the indigenous animal wildlife species. In Trinidad and Tobago these animals include the Agouti (*Dasyprocta leporina*), Lappe (*Agouti paca*), Cocrico (*Ortatis ruficauda*) and the Deer (*Mazama americana*). But in Guyana, Brazil, Suriname, French Guyana and Venezuela on the South American mainland these animals are plentiful. In the other islands of the Caribbean other useful species include the Mountain Chicken (*Leptodactylus fallax*) in Dominica; the Jamaican Rock Iguana (*Cyclura collie*) and the Bahamian and Jamaican Hutia (*Geocapromys brownii*) in Jamaica. These latter two are on the world list of endangered species.

Wildlife Farming could also ensure that there will be a gene pool in the wild for future work in the improvement of the captive reared wildlife stock. It was concluded that, wildlife farming had a multi-purpose role to play in Trinidad & Tobago, the Caribbean and Latin America where it must be strongly encouraged.

The Evolution of Wildlife Farming in Trinidad & Tobago
Hislop (undated), defined wildlife farming as the rearing or keeping of (game) animals for the purpose of captive breeding.

In Trinidad & Tobago these game animals have included the following :

(i) **agouti** (*Dasyprostya aguti* now *D. leporina*),
(ii) **alligator /** spectacled caiman (*Caiman crocodilus*/ *Caiman sclerops*)
(iii) **cocrico** (*Ortalis ruficauda*),
[this is one of the two national birds of Trinidad and Tobago];
(iv) **deer/ red brocket deer** (*Mazama americana*),
(v) **iguana** (*Iguana iguana*),
(vi) **lappe / spotted paca** (*Agouti paca*),
(vii) **manicou/ black eared opossum** (*Didelphis marsupialis insularis*),
(viii) **morocoy** (*Geochelene spp.*),
(ix) **tattoo/ nine banded armadillo** (*Dasypus novemcinctus*), and
(x) **wild hog/ quenk/ collared peccary** (*Tayassu tajacu*).

All of the mammals listed above, in particular the agouti, deer, lappe, manicou, and quenk are also of significant importance to South America (Peres, 2000). Hislop (1987) suggested that there appeared to be two categories of wildlife farmers, the hobbyist and the backyard farmer. Dr Carol James in 1988 reported that captive rearing of wildlife has been practiced in many rural communities in Trinidad & Tobago for several years and has outlined the socio-economic benefits of this (James,1988). This was carried out as an underground operation because of the fear of prosecution. An FAO expert [Dr. Asibey] in 1986 suggested that there was no legal prohibition against the keeping of game animals in captivity. However, wildlife farmers should not dispose or trade their animals during the closed hunting season (i.e. April 1st. to September 30th. annually). International conservation and international development organizations have begun to lend support to captive-breeding of wildlife as a basis for food production. These included the **International Union of Nature and Natural Resources**; the **Smithsonian Institution**; and **United Nations Food and Agriculture Organization**. Recently several governments, including that of the Republic of Trinidad & Tobago have become aware of the importance of wildlife farming as a form of economic activity to be exploited or explored by rural communities. Official sanctioning and encouragement of wildlife farming has led to the discovery of a large pool of active farms. These farms were run mainly as hobby units for recreation and after retirement, or as a peasant/ subsistence type operation to supplement incomes. With Dr. Asibey's encouraging initiatives, co-operation among existing farmers was fostered through the formation, in 1984, of the **Wildlife Breeders and Farmers Association of Trinidad and Tobago**. This association provided the ideal avenue for co-operation between the Ministry of Food Production Lands and Marine Resources and wildlife farmers, which continued to flourish to the present. The support of the Wildlife Section of the Forestry Division in the Ministry of Agriculture has also been important.

The role of wildlife farming: An examination of the literature suggested that wildlife farming has a multipurpose function in society. The roles of wildlife farming can be categorized into the following:-
production of food and commercial products; economic opportunities; rural development; recreation and aesthetics; religious activities; biological pest control; integrated farming; education; and conservation benefits.

At present at the Department of Food Production, Faculty of Science and Agriculture at the UWI, St Augustine there exists the Open Tropical Forage–Animal Production Laboratory [OTF-APL] where we are attempting to develop animal production models and systems of production for the following non-domestic animal species:

Rodents: ..... Agouti
(*Dasyprocta leporina*) ..... Capybara
(*Hydrochoerus hydrochaeris*)

Reptiles: ..... Iguana
(*Iguana iguana*) ..... Red tailed Boa
(*Boa constrictor constrictor*) ..... Spectacled Caiman
(*Caiman crocodiles/ Caiman sclerops*)

Marsupial: ..... Opossum
(*Didelphis marsupialis insularis*)

Ruminant: ..... Deer
(*Mazama americana*)

Avian: ..... Cocrico
(*Ortalis ruficauda*)

Suiformes: ..... Collard Peccary or Quenk
(*Tayassu tajacu*)

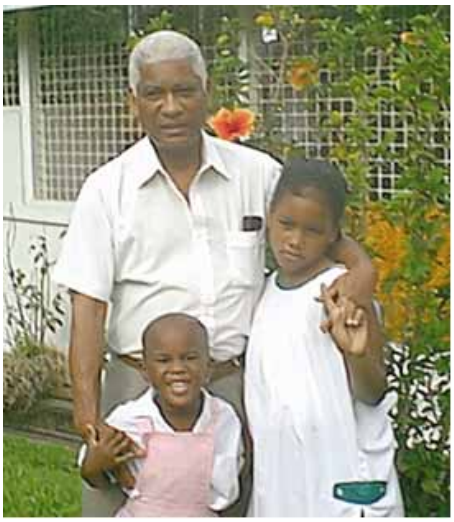
Felines: ..... Ocelot
(*Felis pardalis/ Leopardus pardalis*)

In Trinidad and Tobago work is also ongoing with aquatic species in the Department of Life Sciences, Faculty of Science and Agriculture, The University of the West Indies, and at The Institute of Marine Affairs. Most Ministries of Agriculture in the Caribbean have a Fisheries Division where information on aquatic species can sometimes be obtained.

Part 2

Aryann's Questions on The Agouti

PICTURE 1
Agouti (*Dasyprocta leporina*) Breeding Colonies at Wildlife Farmers in Trinidad and Tobago, W.I., showing the different colour phenotypes (external features)



PICTURE 2
Grandpa Douglas, Anais Garcia and Aryann Garcia at right

ARYANN'S QUESTIONS ON THE AGOUTI

[*Dasyprocta leporina, D. aguti*]

These are the questions that a nine year old girl [Aryann Garcia, page 8] asked about the Agouti. It is also felt that after you have read this document you may want to rear some Agouti at your school in the same way as you rear rabbits.

What type of animal is the Agouti?
It is a medium sized Rodent, i.e. it is a member of the animal family to which rats belong.

Where is it found?
The Agouti lives in a great variety of habitats, from humid tropical forests to fairly dry scrub country. It usually sleeps in the day and goes in search for food at night.

What is the color of the Agouti?
The Agouti has the following colors, brownish black, golden brown, white [yes white], brownish black or golden brown with white feet and chests.

What ways can be used to catch an Agouti?
An Agouti can be hand caught if it is very young, or it can be caught using a strong net, or using a bait trap.

Do these animals grow continuously?
No. They first grow very rapidly in the first eight weeks of their life. At around eight weeks they are taken away from their mommies and so they get no more milk. This is called weaning. They then continue to grow slowly up to about four or five months. Between five months to one year they then grow slowly.

Does it bite or is it dangerous?
Yes it will bite you if it does not know you or is afraid of you. It has very sharp teeth, called incisors, which all rodents and rats have. These teeth grow continuously and can work as a chisel. It is not poisonous and if the animal is obtained when quite young it can become fairly tame if handled and cared for on a daily basis.

How does it make its young and how many does it make?
The Agouti makes its young in a squatting position. The animal makes between 1 to 4 young at a time. But usually it makes about 2 young, 2 to 3 times for the year.

Where does it make its nest or where does it live?
Agoutis can be found from sea level up to elevations of at least 2500m (on top of mountains that are not too high and cold). The agoutis were also described as diurnal (meaning that they go about their business early in the morning and late in the afternoon when it is cool). They live in marshy woods near lowland rivers, as well as in the dry forests, on grassy riverbanks, in dense thickets, and in open savannahs and fields. They sometimes dig burrows under rocks, between roots of trees, or in sloping banks. They would also use hollow logs, holes in trees, stumps

or caves. Nest chambers are sometimes made with a scanty cover of leaves, twigs, roots, and hairs.They can be found in the forest, open fields, cultivated areas or even in backyards.

How does it eat?
The agouti eats by holding its food with it's front paws in a sitting position.

What does it eat?
It eats any type of edible fruit. It eats both the pulp and or the nice part of the fruit as well as the seeds of the fruit. It will also eat roti or bread and vegetable peelings from the kitchen. It likes whole fruits with the seeds in it, as it will also eat the seeds.

Where does it eat?
It eats anywhere it is comfortable. It sometimes bury its food and recover it when it is hungry.

When does it eat?
This animal is a diurnal animal i.e. it is active in the early morning and in the late evening. So that it searches for food at these times. However, in captivity, the animal tend to eat whenever you place a good meal for them.

How is its digestive system made up?
The Agouti has a simple stomach like that of humans, a very long small intestine [about 7 meters or about 21 feet long] and a very large cecum [equal to our appendix]. However, their cecum functions but our appendix does not.

What is the Life Cycle of the Agouti?
The life cycle of the Agouti is very simple. The adults are male and female and they make young males and females which grow up to be adult males and females.

Does it get sick?
The Agouti seldom gets sick. Its main health problem is wounds due to fighting either among adults or between aggressive males and younger animals.

When it gets sick what could we do?
When the wounds develop all you have to do is to attempt to clean them or to prevent the screw worm flies from laying their eggs in their wounds. These could first be cleaned with a mixture of two teaspoons of bicarbonate of soda or Epson salts in one litre warm water. The wounds should be washed twice per day and apply "Negasunt" powder or any anti screw worm treatment.

Can this animal be a pet?
Yes it may make a good pet but you must get it when it is very young.

Can this animal be used as food?
Most certainly YES!!! That is the reason why it is hunted by hunters, even illegally outside of the hunting season.

What is the meat of the Agouti called?
The people in the countryside in Trinidad and Tobago call the agouti meat **"gouti".** But my daddy said that Mr. Harish Coolman in 2004 invented the name **"dasagu"**. Both names sound nice.

How does it sleep?
Agoutis usually sleep on their belly with their front and back feet tucked under them.

In what year was the Agouti discovered?
The Agouti is a mammalian rodent native to Central America [from Mexico], the Caribbean and South America [down to Brazil]. It has been around for a very long time and has been an important source of meat for the native Indians long before Christopher Columbus came to the Caribbean.

Why does it have such a complicated name?
The Agouti's scientific name is *Dasyprocta aguti* or *Dasyprocta leporina*. The scientific name of an animal is made up of two main parts and these are the "Genus" and the "Species". Sometimes those scientists who are responsible for giving the scientific names to animals [animal taxonomists] cannot always all agree and they would give an animal a Genus and Subgenus and / a species and Subspecies. Different animals with the same species name means that they would be able to reproduce if cross-bred and the offspring produced would be fertile.

For the Agouti the breakdown of the scientific name is as follows:
Genus: *Dasyprocta*
Species: *aguti* or *leporina*
Scientific names are either written in italics (*Dasyprocta leporina*) or in plain text and underlined (Dasyprocta leporina). The genus begins with a capital letter and the species begins with a common letter.
The reason for using scientific names is so that people all over the world who speak different languages when discussing an animal can all be sure of exactly which type of animal they are talking about and there would be no confusion.

What is a Mommy Agouti called?
An **"Agujen".**

What is a Daddy Agouti called?
An **"Agujoe".**

What is a very young Agouti called?
An **"Agusuckling".**

What is a mommy Agouti called when she is young?
A **"Aguyoungjen".**

What is a daddy Agouti called when he is young?
A **"Aguyoungjoe".**

Part 3

A Scientific Literature Review on the Agouti and the genus *Dasyprocta*

CLASSIFICATION OF THE AGOUTI

The Agouti [*Dasyprocta leporina, D. aguti*] belongs to the genus *Dasyprocta*. This genus was first introduced into the literature by Illiger in 1811 (Illigeri 1811). The animals in this genus are mammals belonging to the order **Rodentia.** All the suggested or reported species within this genus are indigenous to the New World [the Americas and the Caribbean/ Neotropics]. *Dasyprocta* comes from the two Greek words:

dasy/ dasys – thick with hairy leaves, shaggy, woolly;
procta – akin to buttocks [Grove 1961].
It therefore means ***"animals having thick and hairy buttocks".***

Illigeri (1811) referred to the terms "Aguti" and "Agoiti". He indicated that the genus *Dasyprocta* contained one species which he referred to as *Cavia Aguti*. It seems that this is where the confusion began. The term *Leporinus* was mentioned by Linnaeus 1758 but this was in association with the genus *Mus* [*Mus leporinus*] (Linnaei 1758). This referred to an animal found in Java and Sumatra. The genus *Dasyprocta* was later clearly referred to by Wagler (1832). He referred to this as a new species calling it *Dasyprocta fuliginosa* from Brazil. This he cross referenced with *Mus Monac* (or *Monax*) which was reported by Linnaeus 1758 to be found in America (Linnaei 1758).

The order Rodentia was earlier subdivided into three (3) suborders **Sciuromorpha**, **Myomorpha**, and **Hystricomorph** (Clark and Olfert, 1986; Nowark, 1991). However, Nowark (1999) reported that the order Rodentia has now been divided into only two (2) suborders: **Sciurognathi** and **Hystricognathi**. The formerly known suborder **Hystricomorph** was earlier reported to have one (1) family [Dasyproctidae] with two (2) subfamilies [Dasyproctinae and Agoutinae]. It is now suggested to have two (2) families [Dasyproctinae and Agoutinae]. The present classification of the families, genus and species breakdown for the suborder **Hystricognathi** are as follows:

Kingdom:	**Animalia [Animal]**
Class:	**Mammalia [Mammals]**
Order:	**Rodentia**
Sub-order:	**Hystricognathi**
Family:	**Dasyproctinae** [Agoutis]
Genus:	***Dasyprocta***
Species:	*leporina, cristata, azarae, prymnolopha, fuliginosa, punctata, mexicana, kalinowskii, ruatanica, coibae, guamara, variegata,*
Genus:	***Myoprocta***
Species:	*exilis**,** acouchy*
Family:	**Agoutinae** [Pacas]
Genus:	***Agouti***
Species:	*paca**,** taczanowski*

[Nowak 1999; Honacki et al 1982, Emmons and Feer 1990, 1997 and Eisenberg and Redford 1999].

The Agouti [*Dasyprocta leporina*] is a New World [the Americas and the Caribbean/ Neotropics] mammal belonging to the order **Rodentia**. Nowak (1991 and 1999) reported that there are eleven (11) species of the genus *Dasyprocta* (Agoutis). These are as follows:

(1) *D. mexicana*, southern Mexico, which was introduced into Cuba;
(2) *D. ruatanica*, Ruatan Island off northern Honduras;
(3) *D. coibae*, Coiba Island off south western Panama;
(4) *D. punctata*, southern Mexico to northern Argentina, which was introduced in the Cayman Islands;
(5) *D. fuliginosa*, Colombia, Venezuela, Suriname, Amazon Basin of Peru and northern Brazil;
(6) *D. kalinowskii*, south eastern Peru;
(7) *D. leporina* Husson 1978, Venezuela, Guianas, Brazil, and was introduced in the Lesser Antilles;
(8) *D. azarae*, central and southern Brazil, Paraguay, north-eastern Argentina;
(9) *D. guamara*, Orinoco Delta in north eastern Venezuela;
(10) *D. cristata*, the Guianas; and
(11) *D. prymnolopha*, eastern Brazil.

The species, which seem to have been mostly reported on in the literature were *D. leporina* and *D. punctata*, and even so there have been only a few publications on each of these species. Brown-Uddenberg (2001) contained only thirteen (13) citations on *Dasyprocta leporina* out of the sixty-eight (68) literature citations therein. In addition none of the references had information on a production systems for this species. Hence, it makes the effort in part four of this book pioneering and follow up work is absolutely necessary as this may be applicable to the other 9 or 10 *Dasyprocta* species of which very little is known.

It has been suggested that there has been *Dasyprocta* species uncertainty since 1960 [Cabrera, 1960 as cited by Meritt, 1983; Curtin, 1982 and Smithsonian, 1993], and to date there has also been limited or minimal information on nine (9) of the reported species. Most of the information reported has been on *Dasyprocta leporina* Husson 1978, Illiger 1811. This is a neo-tropical rodent that is on the verge of domestication. A review of the literature and discussions with hunters in Trinidad and Tobago reported on by Garcia and Johnson (2003) suggested the following:

(1) there exist a wide range of genetic diversity within the genus *Dasyprocta* and the potentially limited number of species contained therein as is evidenced by the color variations, the widespread distribution throughout Latin America and the Caribbean, the body size variation and the reproductive productivity variation [1 to 6 animals per parturition, and 1 to 3 parturitions per year];

(2) within Trinidad and Tobago there seems to be present the widest diversity or variation of the genus *Dasyprocta* so far reported on in the literature [this would be elaborated on under the section on Physical Appearance];

(3) 11-12 species within the genus *Dasyprocta* do not exist;

(4) *D. leporina* and *D. punctata* seem to be the same species;

(5) all the other reported species of the genus *Dasyprocta* may be just phenotypic expressions of color, facial or size variations; and some are suggested to be the same as either *D. leporina* or *D. punctata*.

Garcia and Johnson (2003) concluded that within the genus *Dasyprocta* there seem to be only one species and that the best suited name for the merged species may be *Dassyprocta leporina-agouti*. What is now needed is to once and for all do the molecular characterization of all the reputed species of *Dasyprocta*. In the absence of this it appears that there exist only one species of the genus *Dasyprocta*, which could be most appropriately collectively called *Dasyprocta leporina-agouti*. This is a very appropriate name for a "hairy buttocks hare like" rodent after which the "Agouti Allele" (Searle, 1968) was named. The evidence for conclusions (3), (4) and (5) of Garcia and Johnson (2003) is presented in Table 1.

Table 1: Comments on reported *Dasyprocta* species

Species	Reviewed by [cited by Honacki *et al* (1982)]	Comment	Species relation
[1] *D. leporina* Husson 1978 *D. aguti* Illiger 1811 *D. leporina* Cabrera, 1961 Varona 1974 Husson 1978	Cabrera 1961 Varona 1974 Husson 1978	Husson 1978 suggested that *cristata* and *leporina* are the same. Emmons and Feer 1990, 1997 did mention *D. leporina* as an alternative name for *D. agouti*, this was probably a misspelling of *aguti*, and Eisenberg and Redford (1999) also suggested that this was similar to the misspelt *D. agouti* and to *D. azarae.*	= *cristata* = *azarae*
[2] *D. cristata* Desmarest, 1816	Hershkovitz 1972 Husson 1978		= *leporina*
[3] *D. azarae* Lichtenstein, 1823		Emmons and Feer Suggested that this is similar to *aguti/leporina and fulginosa*	= *fulginosa* = *aguti/ leporina*
[4] *D. prymnolopha* Wagler, 1831	Cabrera 1961 Ojasti 1972	Ojasti 1972 suggested that the status of this species was uncertain. Eisenberg and Redford 1999 suggested that this was similar to *punctata.*	= *punctata*
[5] *D. fuliginosa* Wagler, 1832	Allen 1915	Similar to *D. mexicana* and *D. azare*	= *mexicana* = *punctata* = *azare* = *aguti/ leporina*

[6] *D. punctata* Grey, 1842	Goldman 1913 Handley 1976	*variegata* included in *punctata* by Honacki *et al* 1982, and Eisenberg and Redford 1999, and they suggested that it was similar to *azarae*.	Therefore *punctata* = *leporina*
[7] *D. mexicana* Saussure, 1860	Hall 1981	Similar to *punctata*, or possibly a hybrid with it Emmons and Feer 1990, 1997.	= *punctata*
[8] *D. kalinowskii* Thomas 1897			?
[9] *D. ruatanica* Thomas 1901		Similar to *punctata*	= *punctata*
[10] *D. coibae* Thomas 1902	Hall 1981	Similar to *punctata*	= *punctata*
[11] *D. guamara* Ojaasti 1972		Similar to *leporina*	= *leporina*
[12] *D. variegata*		Reported as a seperate species only in Emmons and Feer 1990, 1997. They suggested that this group integrates with *fulginosa* [Black Agouti] , the Central American Agouti *punctata* and the azaraís Agouti , *azarae.*	= *punctata* = *fulginosa* = *azarae* Therefore = *leporina*

References:

[1] Emmons and Feer (1990, 1997)
[2] Reid (1997),
[3] Linares (1998),
[4] Eisenberg and Redford (1999)
[5] Honacki *et al* (1982).

Source: Garcia and Johnson (2003)

A summary of the relationships between the different species presented in Table 1 are as follows:

If
D. leporina = D. cristata = D. azarae
D. azarae = D. aguti/ D. leporina = D. fuliginosa
D. prymnolopha = D. punctata
D. mexicana = D. punctata
But
D. fuliginosa = D. mexicana = D. punctata = D. azarae = D. aguti/ D. leporina
D. ruatanicia = D. punctata
D. coibae = D. punctata
D. guamara = D. leporina
D. variegata = D. punctata = D. azarae = D. fuliginosa
Therefore
***D. punctata** = D. cristata = D. azarae = D. aguti/ D. leporina*
= D. fuliginosa = D. prymnolopha = D. mexicana = D. ruatanicia = D. coibae
= D. guamara = D. variegate = ***D. leporina.***

D. kalinowskii Thomas 1897 is therefore questionable as it was only reported on once.

Based on the above it could deduced that there is only one species within the genus *Dasyprocta*, and that this has a widespread distribution in Latin America and the Caribbean [Table 2]. This table also demonstrates that the Agouti and the animals within the genus *Dasyprocta* has a wide range of names. It also has wide phenotypic (colour) variation [Table 3, and Pictures 1, 3 to 12].

An examination of what is the significance of the species names will now be elaborated as has been reported by Garcia and Johnson (2003).
The suggested species name reflects the following meanings as found in the Webster Dictionary (Gove 1961):

[1] *aguti* ..no explaination found; *leporina* .. from the Latin word leporinus which means "Hare";

[2] *cristata* ..having a "Crista" or a Crest, [we are not sure if this has to do with the hairy collar around the neck];

[3] *D. azarae*…..possibly named after Felix de Azara, 1821 a French Soldier and Naturalist, [but another source indicated that it was named after Felix Manuel de Azara, a Spanish officer of the Paraguayan Frontier 1781-1801 (www.arthurgrosset.com) this latter suggestion seems more logical as there was no French presence in Paraguay;

[4] *prymnoloph* ….Greek Pry.. means claws [this could mean all agouti as each toe of the hind feet has claws];

[5] *fulginosa* .. Greek *Ful*..full..; *Nos*..nose…"full of nose" [This could be considered an appropriate description for all agouti as well, but the photograph obtained of *D. fulginosa* (Picture 9) would suggest that this may be a phenotypic trait];

[6] *punctata* ? ..punctuated?
[7] *mexicana* ..Named after where it was found, in Mexico;
[8] *kalinowskii* ?
[9] *ruatanica* .. Named after where it was found, on the Roatan Island, Honduras;
[10] *coibae* ……..Named after where it was found, on the Coiba Island , Panama;
[11] *guamara* .. Named after the local name (guamara) that it is called by the Warao indians in the Orinoco Delta where it was found, and which is only 12 miles west of Trinidad, Republic of Trinidad and Tobago;
[12] *variegata* ..Variegate…….diversity of colours and tints, diversity in spots, streaks or stripes. See the explanation on Agouti hair coat in the section on the "Meaning of the term Agouti in Animal Genetics".

Garcia and Johnson (2003) suggested that the above and the contents of Table 1 would indicate that the naming of the species had nothing to do with the inability of these species to produce fertile offspring with each other. The names seems to have been based on colour, appearance, who discovered or reported it first. These were mostly non-scientifically precise and subjective reasons. Table 2 presents a key of the *Dasyprocta* species reported with their common names and distribution. **Most instructive is that within Brazil "Cutia" is a common name for the following species, *D. leporina*, *D. azarae*, *D. prymnlopha* and *D. fuliginosa.***

Table 2:
Key and Descriptions of the *Dasyprocta* species reported
[Common names, distribution and measurements]

Species **[Common Name]**	Distribution	HB **[mm]**	T [mm]	HF [mm]	E [mm]	Wt **[kg]**	Comment
[1] *D. leporina* *[D. aguti]* [*D. leporina cayana, D. leporina flavescens]* **[Red Rumpted Agouti; Golden Rumpted Agouti]** **[Cutia (Br), Goudhaas, Konkoni (Su), Picure, Acure, Akuri, Akuli (Ve)]**	**Venezuela, Guianas, Brazil, and was introduced in the Lesser Antilles;** Native to Trinidad and Tobago.	**490-640**	**13-30**	**118-148**	**40-47**	**3-5.9,** 2.6-5	**Similar in size to *D. azarae*** **[Aguti Bayo]** *D. fuliginosa, D. guamara* Live weights of 4.0 to 5.9 kg have been reported by Dubost (1988) French Guyana. This therefore suggests a high live weight potential.
[2] *D. cristata*	**the Guianas**						
[3] *D. azarae* [Aguti Bayo] [Azaraís Agouti] [Aguti amarillento (Ar); Cutia (Br), Acuti (Pa)	**central and southern Brazil, Paraguay, north-eastern Argentina;** SA East of the Andes	**494** 452-575	**24** 14-33	**113** 100-120	**37** 35-46	**2.7** 2.4-3.2	**Similar to *D. punctata***

[4] *D. prymnolopha* [Black Rumped Agouti] **[Cutia]**	**North eastern Brazil south of the Amazon**						**Similar to *D. punctata***
[5] *D. fuliginosa* [Black Agouti] [Agouti Negro] [Cutia (Br), Guatin, Aguti, Picur, Conejo Negro, neque, (Co), Guatusa (Ec), Anuje (Pe), Picure, Acure Picure Negruzco, Yatundoo (Ve)]	**Colombia, Venezuela, Suriname, Amazon Basin of Peru and Western Brazil**	**542-760**	**20-39**	**120-143**	**36-49**	**3.5** [4.5 to 7.0]	**Similar to *D. Azarae***
[6] *D. punctata* [Central American Agouti] **[includes *D. variegata*]** **[Indian Rabbit (Be), Guatusa (CR, Ec), Gautin (Co), Guaqueque, Alazan (Me), Neque, Cuinco (Pn), Picure, Cajare, Kwasha (Ve)**	**southern Mexico to northern Argentina, which was introduced in the Cayman Islands**	**450-570**	**20-40**			**3-4**	**Similar to the Mexican Black Agouti, Similar to** *D. leporina*
[7] *D. mexicana* [Mexican Black Agouti] **[Cerreti, Cuacechi, Quaqueque Negro]**	**southern Mexico, was introduced into Cuba;**	**446-557**	**20-30**			**2-4**	**Similar to *D. punctata* [reddish brown]**
[8] *D. kalinowskii*	**south eastern Peru**						**Uncertain status;** Similar to *D. fuliginosa D. variegata [D. punctata]*
[9] *D. ruatanica* [Roatan Island Agouti]	**Ruatan Island off northern Honduras**	**435**					**Similar to *D. punctata* [reddish brown] but smaller**
[10] *D. coibae* **[Coiba Island Agouti]**	**Coiba Island off south western Panama**	**435-520**	**30-40**				**Similar to *D. punctata* [reddish brown]**

[11] ***D. guamara*** [Picure deltano]	**Orinoco Delta in north eastern Venezuela**	**467-577**	**20-23**	**135-140**	**40-46**	**2.2-3.0**	**Similar to *D. leporina* from Trinidad and Tobago**
[12] ***D. variegata*** **[Brown Agouti] Aguti rojizo (Ar), Cutia (Br), Anuje (Pe)** [Emmons and Feer 1990, 1998]	**South America east of the Andes**	**445-540**	**11-38**	**94-120**	**41-45**		**Similar in shape to Red rumped Agouti *D. leporina***

Key to Abbreviations:
HB: Head and body length [from nose to tail]; T: length of Tail; HF: Length of hind foot; E: length of ear; Wt: weight of non pregnant adult ; mm:millimeters; kg: kilograms;
Br: Brazil; Su: Suriname; Ve: Venezuela; Ar: Argentina; Pa: Panama; Co: Colombia; Ec:Ecuador; Pe: Peru; CR: Costa Rica; Me: Mexico
Primary Sources of Information:
Allen (1915), Honacki *et al* (1982), Emmons and Feer (1990, 1997), Reid (1997), Linares (1998), Eisenberg and Redford (1999), Nowark (1991, 1999) and Smithsonian/Anon (1993).
Source: Garcia and Johnson (2003)

Table 3: Reported colours of the different species within the genus *Dasyprocta*. Species

Species	Colours
[1] *D. Aguti* Illiger 1811 *D. leporina* Husson 1978 [Red-rumped Agouti]	H, Ft: Or, Ogr, R: DR, Brilliant Or, The base of the long rump hairs are usually paler Y or Or at the base; H to Mid Back: Bl Hairs T: Bare Underparts : Grizzled Br, Or, or Or with W midline Toes: Strong Toes and Hooflke nails
[2] *D. cristata* Desmarest, 1816	
[3] *D. azare* Lichtenstein, 1823 [Azaraís Agouti]	Bd: Mid Bk: R: Bl frizzled with W or Pale Or (grey) UP: Grey to Olive Green Top of Head Blakish Ft: Bl
[4] *D. prymnolopha* Wagler, 1831 [Black-rumped Agouti]	Bd: YOr to Dark R Or R: Bl long hairs Pale Y at Base UP: Pale Or Neck: Crest of Long Bl hairs Ft: Dr Br

[5] *D. fuliginosa* Wagler, 1832 [Black Agouti]	Bd: Black hairs with tiny white tips R: Bl UP: Br and W Chin and inguinal region: Whitish, Belly : W Ft: Bl T:Bl, White or Strongly Grizzled white
[6] *D. punctata* Gray, 1842 [Central American Agouti]	Bd: Highly Variable colours Y to Or Mid Bk: Or R: Cr or Bl UP: Two types RBr or Y Br, GrY Chin and inguinal region : Whitish Belly: Br; Ft: Bl or Br
[7] *D. mexicana* Saussure, 1860 [Mexican Black Agouti]	Ch and T: White Note UP: Bl or DrBr with finely grizzled white Mid belly: White stripe down mid belly Feet Black with White Toes on Hind feet Bd: Black Fur Grizzled with White; R: Bl
[8] *D. kalinowskii* Thomas 1897	
[9] *D. ruatanica* Thomas 1901	Like *D. punctata* UP: OrBr grizzled with Bl
[10] *D. coibae* Thomas 1902	Like *D. punctata* UP: Y to Br with Bl
[11] *D. guamara* Ojasti 1972 [Picure Deltano]	Ch: OrBl and W R: Dark T: Cr or Bl and W B: Mottled Grey or Bl
[12] *D. variegata* [Brown Agouti]	UP: Bl, Y, Br, BlOr, Or T: W

Key to Colours: Black [Bl]; Brown [Br]; Dark Brown [DBr]; Orange [Or]; Golden Brown [GBr]; Yellow [Y]; White [W]; Olive Green/ Olivaceous [OGr]; Dark Red [DR]; Pale Yellow [PY]; Pale Orange [POr]; Cream [Cr]

Key to body parts: Rump [R]; Back [Bk]; Body [Bd]; Chest [Ch]; Fore Quarters, Legs and Feet [Ft]; Eyes [E]; Head [H]; Underparts [UP]; Throat [T].

References:

[1] Emmons and Feer (1990, 1997)
[2] Reid (1997),
[3] Linares (1998),
[4] Eisenberg and Redford (1999)
[5] Honacki et al (1982).

Source: Garcia and Johnson (2003)

THE DISTRIBUTION OF THE AGOUTI

The Agouti [*Dasyprocta leporina*] is now found on many of the Caribbean islands [Cuba, The Cayman Islands, Puerto Rico, The Virgin Islands (i.e. St. Thomas and St. Croix), St. Kitts, Dominica, Monserrat, Guadeloupe, Martinique, St. Lucia, St. Vincent, Grenada and Trinidad and Tobago], Venezuela, Guyana, French Guyana, Surinam, Amazonian and Eastern Brazil [Table 2]. It was introduced into the Virgin Islands. It is also present in Zoo exhibits in many parts of the world and Agoutis have frequently been used in zoological exhibits in the United States.

THE AGOUTI: A NEOTROPICAL ANIMAL ON THE VERGE OF DOMESTICATION

The Agouti [***D. leporina***] is hunted and prized for its meat and it is one of the thirty or so Neo-tropical animals identified by Ojasti (1996) as being of economic and social importance to Latin America and the Caribbean. Peres (2000) reported that in a specific area of Amazonian Brazil over a 10 year period, *Dasyprocta* species harvested accounted for an annual harvest range of **603,312** to **1,479,177** animals or **2,171.9** to **5,325.0** tonnes of harvested meat. This was approximately 3.6 % of the mammalian biomass harvested. The *D. leporina* harvested by hunters in the small island state of Trinidad and Tobago is of a similar social and economic importance (Mollineau *et al* 2000, Roopchand 2002).

If the Agouti is to be used continuously without becoming endangered either through use as a source of wild animal protein or as game, or if it becomes scarce in zoological exhibits, alternative sustainable sources for the animal must become available. The development of an intensive production system for the commercial production of Agoutis in captivity would provide this alternative source (FAO, 1995). Observations and discussions with "wildlife farmers" in Trinidad and Tobago have suggested that there are phenotypic and reproductive variability within the Agouti, which could be exploited. FAO (1995) has also suggested that although wild Agoutis were very shy, when they were taken young, they tamed very easily, and they further stated that **domestication would appear to be possible once a system of husbandry has been worked out**. Ullrich (1993) investigated the potential for domestication of the Agouti (*Dasyprocta leporina*). He investigated the activities and the social behaviour of five (5) colonies of Agoutis, in five (5) zoos in Germany over a five (5) month period (May to September 1992) and the FAO (1995) are in agreement with his findings.

Agoutis tame easily, therefore they could be mass-produced on a large scale like rabbits or guinea pigs. Additionally, there has not been any organised scientific attempts to raise agoutis in captivity. Although, there was a research project being conducted on the captive breeding of two agouti species (*Dasyprocta mexicana* and *D. punctata*) for food, in Tuxtla Gutierrez, Mexico, there was need for additional research [NRC, 1991]. They further sug-

gested the need for husbandry experiments, which should include topics on nutrition, shelters and enclosures, reproduction, growth rate, and techniques for catching, moving, marketing and managing these animals. The above has provided the necessary justification for the approach taken by Brown-Uddenberg (2001). This work was started by Mrs. Roxanne Brown-Uddenberg and Dr Gary Wayne Garcia at the UWI, University Field Station in Trinidad, Trinidad and Tobago. The approach taken in this review was similar to that taken by Makita et al (1995) for the Lesser Mouse Deer, which may be possibly the smallest ruminant in the world.

THE PHYSICAL APPEARANCE AND MAKEUP OF THE AGOUTI

The agouti (*Dasyprocta leporina*) has been described as a brownish, golden rump, Neotropical rodent of South and Central America [Cover Photograph]. It has also been described as a hare-sized, diurnal rodent, which was highly valued for its meat, and is relentlessly hunted through out its range.

In Trinidad there are the following colour types:

- brownish golden-rumped (Picture 3 and 4),
- grey-black or blackish brown (Picture 8),
- the above two types with white feet and chests [cover photo],
- as well as pure white animals [Pictures 1 & 6] and
- White animals with brown streaks all over the body [Picture 7].

It is felt that white hair may be homozygous recessive, that is, it may not be a dominant gene that is easily passed on by the parents to the offspring. In the literature, so far there have been no reports of pure white agoutis. The Agouti could be easily mistaken for the Acouchi (*Myoprocta acouchy*), which has a tail and is slightly smaller in body size. The dorsal hair of the agouti becomes erected (pilo-erection) when the animal becomes mildly alarmed and when fleeing from a predator (Kleiman, 1974). Table 4 has summarised some of the morphological features and the vital data of the Agouti. Table 3 presents the different coat colours reported within the genus *Dasyprocta.* Colour photographs for Dasyprocta leporina from Trinidad and Tobago and for some of the different reported species are presented in Pictures 3 to 12.

Agoutis are terrestrial and have been adapted for a cursorial life. They could walk, trot, or gallop on their digits, and could also jump vertically at least two meters (2m) from a standing point and as far as six meters (6m) (Nowak and Paradise, 1983 and NRC, 1991). They also swim well (NRC, 1991). They often sit with their body erect and ankles flat on the ground, a position from which they could dart off at full speed (Nowak and Paradise, 1983). If danger threatened they may pause motionless with one forefoot raised. If they were discovered, they would travel with remarkable speed and agility. The external form of the agouti's body has been modified for running, in that the limbs, especially the hind legs, are lengthened and the lateral toes are reduced in size. The thumb is vestigial. The forefoot has

four functional digits and the hind foot has three. Each toe of the hind-feet has claws, and the soles of the feet are naked.

Agoutis were also reported to adapt well to laboratory environments. They have been used for research in comparative reproductive physiology (Weir, 1971 and 1974), and they were also used in serum enzymology and pharmacology (Bacher, *et al*, 1976). Because of their size (3-5 kg), this species would be suitable for surgically oriented studies other than the other common hystricomorphs such as the guinea pig and chinchilla. In addition, it is possible to do blood studies on the agouti, since it may be possible to obtain large volumes of blood (up to 50 mls) on a continuing basis without injury or risk to the animal. The longevity of the agouti in captivity (15-20 years) also indicated that the agoutis could be used in long-term studies (Baas, *et al.*, 1976). Their further use should be considered for selected categories of research that would require hystricomorph rodents.

Table 4: The Morphological Features and Some Vital Data of the Agouti (Dasyprocta sp.)

Characteristics		Source
Adult body length	40-46 cm	Baas, *et al*., 1976
(nose-to-tail)	41.5-62 cm	Clark and Olfert, 1986. Grzimek,1975, Nowak,1991.
Tail length	1 - 3.5 cm	Clark and Olfert, 1986, Grzimek, 1975. Nowak, 1991
Body weight		
Adult	1- 3.4 kg; 3.4 - 5 kg; 1 - 3 kg	Clark and Olfert, Norwak, 1991, Grzimek, 1975, Baas, *et al.*, 1976.
Adult Female	4 - 5 kg	Meritt, 1978.
Adult Male	3.5 kg	Meritt, 1978.
New Born Female	210 - 355 g	Brown-Uddenberg, 2001.
New Born Male	225 - 308g	Brown-Uddenberg, 2001.
8 weeks Male	723 .5 - 1298.8g	Brown-Uddenberg, 2001.
8 weeks Female	1088.9- 1306 .6g	Brown-Uddenberg, 2001.
Colour		
upper parts	ranges from pale orange To several shades of brown to black.	Norwak,1991. Norwak and Paradise, 1983 . Baas, *et al.*, 1976
lower parts	ranges from yellow to buff.	Brown-Uddenberg, 2001.
All over	White Or White feet, white chest and Brown body	Authors' observations
Longevity	18 yrs; 10 - 20 yrs	Clark and Olfert, 1986, Grzimek, 1975.
Body Temperature	38.3 - 40.0 ^{0} C	Baas, *et al.*, 1976
Heart Rate	165 - 250 beats per min.	Clark and Olfert, 1986

THE MEANING OF THE TERM AGOUTI IN ANIMAL GENETICS

Searle (1968) indicated that the main allelomorphic systems known to mammals concern coat-colour, and that one such group is called the Agouti series alleles (A); named after the South American rodent that shows the normal wild type pattern at the locus very clearly. This locus is concerned with the regional distribution of eumelanin (hair bands of black or brown) and phaeomelanin (hair patterns bands of yellow) pigments in the coat. This causes colour pattern banding on the same strand of hair. The pigment colours seen on the hair are white, yellow, tan and black. The genes at this locus also determine the relative amounts of dark and yellow pigments on the dorsal and ventral sides of the animal. The dark dorsal and yellow ventral side seems to be the wild type in certain mammals. This partially explains why Agoutis tend to have dark dorsal patterns with light ventral patterns, as in the Golden Rumped Agouti, Black Agouti and the Central American Agouti. In Trinidad on a single hair taken from an animal shot in the forest it was seen that the colour changes from the base yellow, to tan, to brown to black at the tips of the hairs [Pictures 4 and 5]. In Trinidad it was observed that when pure white agoutis were crossed with Golden Rumped agouti the offspring had white hair with brown colours at the tips and brown rumps [Picture 7]. This has been observed at the Emperor Valley Zoo in Trinidad as well as at the Mr Desmond James in Mausica, Trinidad. The foregoing therefore provides further justification for the conclusion by Garcia and Johnson (2003) that there is only one species within the genus *Dasyprocta*.

AGOUTI HEALTH AND DISEASES

The experiences of most of the wildlife farmers / hobbysts suggests that the Agouti is relitavely easy to rear in captivity with minimal disease problems. In the scientific literature the agouti has been reported to be relatively free of disease and parasite infestations in the wild and in captivity (Bass, *et al*, 1976). However, they have been reported to act as a host for "the american trypanosome" ***Trypanosoma cruzi***, which is the pathogen responsible for Trypanosomiasis in Man (**Chagas' disease**) and in animals (Riberio and Barretto, 1977). *T. cruzi* organisms were observed in blood samples taken from agoutis both from the wild and captive populations of the Trinidad (Cournand, unpublished). The agouti was said to be the sylvatic host for the *T. cruzi* organism. *T. cruzi* infections have been known to occur in the south of Trinidad (Aziz and Parsad, unpublished). The presence of *T. cruzi* organisms in the agoutis located in Trinidad, would suggest that the agouti could be used in the continuing studies, of the association of *T. cruzi* infections with **Chagas' Heart Disease**. Tables 5, 6 and 7 illustrate the diseases and the parasite infestations which were reported to occur in Agoutis.

Table 5:
Diseases and Parasite Infections Reported in Agoutis

Diseases Parasite Infections	Notes
A. Viral & Bacterial Infections.	
I) Foot-and-Mouth Disease (FMD)	The agouti is said to be highly susceptible to experimental infections of FMD via the intradermal and oral routes, and by contact with infected animals of the same species. This suggest that the agouti could be a possible reservoir hosts for the virus. The existence of natural infection has not been observed [Federer, 1969].
II)Pasteurellosis *Pasteurella psuedotuberculosis*	This disease attacks many rodents including the agouti. The clinical signs include anorexia, reduced faecal production, depression, elevated rectal temperature, ruffled hair coat, conjunctivitis, orbital abscesses, respiratory disease, nasal discharge, sneezing, general weakness followed by death. Diagnosis is from blood culture or culture from exudate from clinically ill specimens. Treatment is not usually effective [Wallach and Boever, 1983].
III) Tuberculosis *Mycobacterium tuberculosis var. nominis.*	This disease occurs in captive reared agoutis. Lesions were located in the lungs, liver, spleens, and kidneys and consisted of gaseous nodules with little fibrosis [Baas, *et al*., 1976; Wallach and Boever, 1983].
IV) *Klebsiella pneumonia* V) *Streptococcus sp*. (viridian's group.) VI) *Enterobacter* sp	These bacteria were isolated from the lungs and liver tissue of an agouti at the Veterinary Diagnostic Laboratory, Trinidad. The agouti came from a captive population at the Wildlife Section, Forestry Division, Ministry of Agriculture, Land and Marine Resources [Anon, 1992].

Table 5:
Diseases and Parasite Infections Reported in Agoutis

B. Protozoan Infections	
I) Cocciodiosis	Agoutis which died with hepatic cirrhosis and cholecytitis reported to have Cocciodiosis. The mucous of the upper small intestine was infected with *Eimeria stiedai* organisms. The epithelium of the bile duct did not harbour these organisms. It was believed that the hepatic disease of the agoutis probably resulted from the failure of the coccidia to develop normally in the bilary system. Large amounts of oocysts(3+) of a species of coccidia were recorded in faecal sample taken from a captive agouti population at the Wildlife Section, Forestry Division, Ministry of Agriculture, Land and Marine Resources Trinidad & Tobago[Baas, *et al*., 1976].
II) Trypanosoma cruzi	The agouti act as a host for "the American trypanosome" (*T. cruzi*). *T.cruz*i organism were isolated in blood samples which were taken from agoutis both from wild and captive stocks in Trinidad. The agouti is said to be a sylvatic host for *T. cruzi*..organisms [Baas, *et al*., 1976]. *T. cruzi* infections have occurred in humans in the south of Trinidad. [Aziz and Parsad, unpublished]
III) *Leishmania sp*	In Brazil, it is believed that rodents of the super family Cavioidea may act as reservoirs for the *Leishmania braziliensis* which causes Leishmaniasis in Man. The agouti is a member of this family. There are animal reservoirs of *L. mexicana*, in the forests of Trinidad. However there no reports of occurrence of human infections to date [Riberio and Barretto, 1977].
C. Helminth Infections	The list of helminth parasites which occurred in agoutis is summarised in Table 6.
I) Hydatid Disease (Echinococcosis)	The occurrence of this disease is not reported to be present in the agouti. The agouti is considered to be an intermediate host for *E. oligathus*, in which the salvis cycle occurs [Sousa, 1970].
D. Ectoparasites	Table 7, summarises the ectoparsites found on agoutis. Ectoparasites do not pose a clinical problem in captive reared agoutis.

Table 6:
Helminth Parasites of the Agouti *(Dasyprocta spp.*)

Parasite	Host	Habitat	Location
NEMATODES			
Oxyuroidae Oxyurids	*Dasyprocta agouti* *D. azarae*		Estado de Mato Grosso & Estrada de Perro Brazil.
Rhabdidiasoides *Strongyloides agouti* Strongyloides * Strongyloides ova	 *Dasyprocta agouti* *Dasyprocta azarae* *Dasyprocta leporina*	small intestines **GIT	Quebec, Canada (from Trinidad, WI). Estrada de Perro,Brasil. Trinidad.
Strongyloides Ancylosdtomatidae *Monodonius aguirari*	 *Dasyprocta agouti*	 intestines	 Estado de Perro, Brazil.
Trichostrongylidae Trichostrongyles	 *Dasyprocta agouti*		 Estado de Mato Grosso, Brazil.
Spiuroidae *Physalopthera torresi*	 *Dasyprocta agouti*		 New York Zoological Gardens, USA & Brazil.
Trichinelloides Trichostrongyles	 *Dasyprocta azarae* *Dasyprocta agouti*		 Estado de Mato Grosso & Estrada de Ferro, Brazil
* Helminthoxys urichi	*Dasyprocta leporina*	**GIT	Trinidad
*Trichunis spp	*Dasyprocta leporina*	**GIT	Trinidad
*Trichostrongyles	*Dasyprocta leporina*	**GIT	Trinidad
CESTODES			
Taeniidae *Echinococcus* *Oligarthus*	 *Dasyprocta agouti* *Dasyprocta punctata*		 Panama
Cysticercus (larvae)	*Dasyprocta azarae*		Estrada de Perro, Brazil.

Sources: Bass, *et a*l., 1976.
* Cournand, unpublished.
** Gastro Intestinal Tract.

Table 7:
Ectoparasites of the Agouti *(Dasyprocta sp.)*

Parasite	Host	Location
Mallophaga		
Gyropus (2 species)	*Dasyprocta agouti*	Brazil
Macrogyropus amplexans	*Dasyprocta agouti*	South America
Amplexans	*D. azarae, D. fulginosa, D. variegata.*	
**Ixodidae Amyblyomma*	*D. leporina*	Trinidad
**Polygen*	*D. leporina*	Trinidad
**Gyroptidae Macropgyropus Amplexanas*	*D. leporina*	Trinidad
Siphonaptera		
Rhopalopsyllus lugubris	*Dasyprocta agouti*	Bogota, Colombia
R. australis australis	*D. agouti*	Trinidad, WI.
R. australis tamoyus	*D. azarae*	San Berdino Paraguay.
R. roberti	*D. azarae*	Sao Paulo, Brazil

Sources: Bass, *et al*.,1976.
* Cournand, unpublished.

FEEDING AND NUTRITION OF THE AGOUTI

The Digestive System
The Mouth

The **mouth** of the agouti consists of two sub regions, the vestibule and the mouth cavity proper, the former is the smaller of the two. The dental formula is incisors 1-1 / 1-1; canines 0-0 / 0-0; pre-molars 1-1 / 1-1; molars 3-3 / 3-3 = 20. The premolars and molars are approximately the same size and are closely packed. The teeth are hyposodant, semi-rooted and flat crowned (Nowak and Paradise, 1983). The edges of the upper and lower lips form the buccal pads. Between the caudal to buccal pads there are two flaps call the bristle area. This bristle area is covered with minute hair. The major anatomical structures of the mouth cavity include the palatal surfaces, the tongue and the cheeks. The palatal surfaces are subdivided into the diastema and the hard and soft plates. The soft plate lacks bony support and is located dorso-posteriorly to the molar. The hard plate is triangular, supported by bone and is found between the premolars and molars. The tongue is a large pink spatula shaped muscular organ. The cheek extends from the commissures of the lips to the caudal end of the masseter muscles and borders the mouth cavity laterally. There are lateral cheek pouches present (Garcia, *et al*., 2000).

The Oesophagus

The **oesophagus** is pink coloured and is divided into cervical, thoracic and abdominal portions. This tube is long (15.4 cm) and has a consistent diameter (0.5 cm) through its length. The oesophagus connects the laryngeal portion of the pharynx to the stomach (Garcia et al 2000).

The Stomach

The **stomach** is a sac-like pink organ located between the oesophagus and the small intestines. It consists of four sub-regions, the cardia, the fundus, the body and the pylorus. The cardia is the area that surrounds the oesophagus at the point of contact with the stomach. The fundus forms a conspicuous bulge. The body lies between the fundus and pylorus. The pylorus has a progressively decreasing diameter with a minimal value at the point where it joins the small intestines. The pyloric sphincter is a thick muscular band, which constricts the junction of the stomach and the small intestines, (Jones, 1834 and Garcia, *et al.*, 2000).

The Small Intestine

The **small intestine** is the longest part of the digestive tract; **it constitutes 80.57% of the total length of the digestive tract** [Table 8]. The small intestine is extremely coiled through out most of its length except closer to the ileum. It is subdivided into three parts based on location namely the duodenum, the jejunum and the ileum. The first portion of the duodenum is S-shaped and is looped and folded at the base of the mesentery which suspends it. The jejunum is the longest region of the digestive tract and it is highly coiled. The ileum is the last part of the small intestine; it is lodged between the caecum and the first part of the colon. Microscopically the small intestine of the agouti has a very high concentration of villi (Garcia, *et al.,* 2000).

The Cecum and Large Intestine

The **large intestine** is subdivided into the cecum, colon, rectum, anal canal and anal glands. The cecum is the first part of the large intestines. It is a greenish brown semi-circular sac. There are two white longitudinal bands, which run along the external surface. The bands run along the dorsal and ventral curvature. These structures are called the dorsal and ventral tenia. These teniae produce many saccular out pouches called haustra. The colon extends from the cecum, and terminates at the rectum. The rectum and anus are the last two segments of the large intestines, which are both pink in colour. The anal sphincter separates the rectum from the anus. The terminal point of the rectum extends over two pink, bean shaped glands called the **anal glands**. The glands have two openings, which connect with the luminal surface of the rectum caudally (Garcia, *et al*., 2000). Pictures 13 and 14 shows the gastro intestinal tract of the Agouti.

Table 8:
Contribution of the Different components of the Digestive System of the Agouti.

Region	As a % of the Total Length of the GIT [n=10]	As a % of the Total Weight of the GIT [n=10]
Oesophagus	1.79 ± 0.42 %	2.31 ± 0.37 %
Stomach	1.62 ± 0.17 %	13.01 ± 2.59 %
Small Intestine	80.57 ± 1.42 %	49.10 ± 3.9 %
Cecum	2.61 ± 0.36 %	16.80 ± 4.11 %
Colon & Rectum	13.44 ± 1.42 %	18.77 ± 2.11 %

Source: Garcia et al 2000

COMPARISON OF THE DIGESTIVE SYSTEMS OF THE AGOUTI WITH THAT OF THE RABBIT AND THE GUINEA PIG

The agouti (*Dasyprocta leporina*), the rabbit (*Oryctolagus cuniculus*) and the guinea pig (*Cavia cobaya*) were reported to be non-ruminant herbivores (NRC, 1995). They have a caecum and a colon, which are extremely large and contain a large population of microorganisms. These microorganisms may be capable of digesting fibre as well as synthesising a number of vitamins (Ensminger and Olentine, 1978). The digestive anatomy and physiology of the agouti, the rabbit and the guinea pig all bare some similarities, and it is therefore possible that the nutrient requirements of the three species may be similar. The descriptions of the digestive systems of the agouti, the rabbit and the guinea pig are compared and summarised in Table 9.

The small intestines of the agouti were reported to be similar to that of the guinea pig's, except for the length. The agouti's small intestine (700.2 cm) was approximately seven times longer than that of the guinea pig's (125 cm). This suggested that the agouti might have very good nutrient absorption capabilities. Tables 9 and 10 illustrate the varying lengths and diameters of the different parts of the digestive systems of these animals respectively. The extreme length of the agouti's small intestine relative to the other regions of the digestive tract would allow it to achieve a higher level of absorption. Therefore, the agouti should have the ability to digest foods with a significant amount of soluble carbohydrates, as would be evident from its fruit eating habits.

The agouti's large intestines possessed similar macroscopic features, which was typical to that of the mammalian's large intestine, thus they should perform similar functions. Parra (1978), indicated that the presence of numerous haustra in the cecum of animals would account for their fermentation abilities. The agouti, like the rabbit and the guinea pig was reported to be a hindgut fermentor (NRC, 1978, Parra, 1978 and Garcia, *et al*., 2000).

Therefore the agouti should be able to digest a diet that was fairly high in structural carbohydrates. The rabbit and the guinea pig were reported to practice coprophagy (the ingestion of faecal matter). The main advantage of this peculiar feeding behaviour was the recycling of nutrients, which may not have been absorbed in the cecum or the large intestine.

Table 9:
The Length of Each Region of the Digestive Tract of the Rabbit, the Guinea Pig and the Agouti.

Region	Rabbit	Guinea Pig	Agouti
Oesophagus	11.4 +/- 1.15	12 - 15	15.37 +/- 4.05
Stomach	10.25 +/- 0.90		13.38 +/- 1.78
Small intestine	256 +/- 16.64	125 Duodenum 10 - 12 Jejunum 95 Ileum 10	700.16 +/- 124.4
Cecum	25.33 +/- 3.36	15 - 20	22.47 +/- 4.41
Colon & Rectum	121.13 +/- 4.55	Colon 70 - 75 Rectum 7 - 10	117.11+/- 24.73
Loops			41.74 +/- 13.95
Appendix	11.18 +/- 0.72		
Source	**Wingerd, 1984**	**Cooper & Schiller, 1975**	**Garcia, *et al.*, 2000**

Feeds

The agouti would eat any kind of vegetable matter Matthews (1971). Grzimek (1975) described the agouti to be a herbivore [an animal which eats grasses]; whilst Meritt (1978), said that the agouti was a frugivore [an animal which eats only fruits]. The NRC (1991), reported that these herbivores would eat seeds, fruits, stalks, leaves, roots, and other succulent plant parts, as well as occasional insects and fungi. In Trinidad, the agoutis both in the wild and in captivity, were reported to eat a wide variety of fruits, from trees and shrubs (40 species); herbs and grasses (4 species); garden crops (17 species); cooked food (bread and rice), and livestock feed (broiler and pig ration) [Hislop, undated, as cited by Asibey,1984 and authors observations]. Table 11, has summarised the wide variety of food agoutis (captive and wild) have been reported to eat in Trinidad.

Table 10:
The Width (cm) of Each Region of the Digestive Tract in the Rabbit and the Agouti.

Region	Rabbit	Agouti
Oesophagus	0.5 +/- 0.1	0.5 +/- 0.2
Stomach		
Pyloric	3.6 +/- 0.7	3.2 +/- 0.6
Fundus	6.1 +/- 0.6	5.5 +/- 1.3
Body	4.8 +/- 0.7	5.6 +/- 1.2
Small Intestine		
Duodenum & Jejunum	0.8 +/- 0.1	1.4 +/- 0.8
Ileum	0.6 +/- 0.1	0.4 +/- 0.2
Large Intestine		
Cecum		
Cranial	3.8 +/- 0.6	4.2 +/- 0.8
Caudal	2.3 +/- 0.5	2.4 +/- 0.4
Colon		
Cranial	2.0 +/- 0.2	2.4 +/- 0.9
Caudal	1.4 +/- 0.2	1.3 +/- 0.4
Rectum	1.1 +/- 0.3	1.3 +/- 0.3
Appendix	1.5 +/- 0.3	

Source: Baptise, (unpublished).

Table 11:
Various Types of Food Consumed by the Agouti (*Dasyprocta leporina*) both in the Wild and in Captivity.

	Type of Food		Type of Agouti	
	Common Name	Scientific Name	Wild	Captive
Trees	Acurel	*Trchilia sp.*	*	
	Acoma	*Sideroxylon quadriloculare*	*	
	Argalie/ Agalie/ Agali	*Ficus spp.*	*	
	Balata	*Manilkara bidentata*	*	*
	Bios Charbon	*Diospyros ierensis*	*	
	Bios Multare, Fineleaf	*Penetaclethra macroloba*	*	
	Breadfruit	*Artocarpus altilis*		*
	Cajuca, Wild Nutmeg	*Virola surinamensis*	*	
	Cashew nut	*Anaccardium occidentale*	*	
	Chatigne	*Artocarpus mariannensis*	*	*
	Chenet/ Chinette √	*Meliococcus bijugatus*	*	*
	Citrus	*Citrus sp.*		*
	Coconuts [dried]	*Cocos nucifera*	*	*
	Crappo	*Carapa guianensis*	*	
	Five Finger / Carambola √	*Averrhoa carambola*	*	*
	Gru Gru beff/ Groo-groo beff/ Glu-glu beff	*Acrocomia aculeata*	*	
	Guava	*Psidium guajava*		*
	Guatacare	*Fschweilera subglandulosa*	*	
	Hog plum	*Spondis mombin*	*	
	Juniper/ Monkey Apple / Ibo ink	*Genipa americana*	*	
	Kaimit/ Kaimet/ Caimet/ Caimite	*Chrysophyllum cainito*	*	*
	Laurier	*Ocotea sp.; Nectandra sp.*	*	
	Mal Balata	*Chrysophyllum sericeum*	*	
	Mango	*Mangifera indica*	*	*
	Mora	*Mora excelsa*	*	
	White Olivier	*Terminalia obovata*	*	
	Paw-Paw/ Papaya	*Carica papaya*		*
	Penny piece	*Pouteria multiflora*	*	*
	Palmiste	*Roystonea oleracea*	*	
	Pewa/ Piwa/ Peewa	*Guiliema speciosa* *Bactris gasipaces*	*	*
	Pomsitay/ Pomsitay/ Pommecitey/ Pommecithere	*Spondias dolcis*	*	*
	Pomerac/ Malay Apple/ Otaheite Apple	*Eugenia malaccensis*		*
	Pois Douce/ Pois Doux	*Inga ingoides*	*	*

	Sandbox	*Hura crepitans*	*	
	Siebo/ Soiebo/ Soibo	*Rheedia macrophylla; Garcinia marcophylla*	*	
	Wild Cashima	*Rollinia musosa*	*	
	Wild Chatigne/ Chataigne meron/ Wild Breadnut	*Pachira insignis*	*	
	Guava	*Psidium guajava*	*	
	Wild Kamit/ Caimite/ Kaimet	*Chrysophyllum argenteum*	*	
Herbs	Corn	*Zea mays*		*
	Banana	*Musa* cultivar		*
&	Railway daisy/	*Bidens pilosoa*		*
Grasses	Rabbit bush			
	Sugar Cane	*Saccharum officinarum*		*
	Water Grass	*Commelina elegans*	*	*
Garden Crops	Cabbage	*Brassica oleracea*	*	*
	Carrot	*Daucus carota*	*	*
	Cassava	*Manihot esculenta*	*	
	Cauliflower	*Brassica oleracea*		*
	Cucumber√	*Cucumis sativus*		*
	Dasheen	*Colocasia esculenta*	*	*
	Lettuce	*Lactuca sativa*	*	*
	Melongene/ Eggplant	*Solanum melongena*		*
	Melons√	*Cucumis melo*		*
	Potatoes√	*Solanum tuberosum*		*
	Pumpkin	*Cucurbita moschata*		*
	Sweet Potato	*Ipomea batatas*		*
	Sweet Pepper√	*Capsicum annuum*		*
	Spinach√	*Amaranthius sp.*		*
	Tomato	*Solanum esculentum Lycopersicon esculentum; L. lycopersicum*		*
	Watermelon√	*Citrullus lanatus*		*
	Yams√	*Dioscorea sp.*		*
Cooked Food	Bread			*
	Rice(boiled)			*
	Bake or Roti√			*
Livestock Feeds	Broiler ration			*
	Pig ration			*

This listing is by no means exhaustive.
The diet of the agouti in the wild and in captivity varies according to the availability and seasonality.
Compiled by G. Hislop of The Forestry Division, Wildlife Section, in the Ministry of Agriculture, Trinidad and Tobago. **Source: Asibey (1984).**
√ Authors Observations
The varied local spellings and updated scientific names were supplied by Mrs. Yasmin Comeau, Curator of the National Herbarium of Trinidad and Tobago, based on Winer (2000) Unpublished.

Feeding Habits

The Agouti would eat during the early morning and evening hours, but on rainy and gloomy days they would feed during the middle of the day. Smythe (1970 a & b) reported that agoutis preferred to eat objects with dimensions of approximately 1.5 cm, but they would attempt to eat objects as small as 5 mm. They would often eat fruits as large as 10-15 cm in diameter. The agouti would move from one place to another after picking up a piece of food. When the animal is eating, it would sit erect on its haunches and nibble at its food. The forepaws are used to manipulate fruits and seeds. Before starting a meal, the agouti would carefully peel off any outer skin (Ramdial and Ramdial 1974). This was unexplainable since, in some instances, the animal would eat the same outer skin later in spite of available food.

Morris (1965) and Smythe (1970 a & b) indicated that food hoarding was a characteristic feature of the agouti. The animal would scatter superfluous food for future use. Scratching several small holes throughout the communal home range and burying separately a single load of food in each hole. The food could be carried up to 50m. The hoards were usually situated near special landmarks. The food, which was carried in its mouth, would be dropped in holes 2-8 cm deep and rammed with the forepaw. Then the cache would be covered with alternating forepaw movements and then camouflaged with vegetative material. Agoutis would also perform this food-burying pattern on a concrete floor. It was thought that this scattering and hoarding behavior probably had survival value.

Nutrient Requirements

Little is known about the nutritional requirements of the agouti. However, similarities in the anatomy and the diet of the rabbit and the guinea pig may suggest that extrapolation from these better known species have been informative, Garcia *et al.,* (2000). The agouti however, was reported to have longer small intestines when compared to the rabbit. This would mean that the agouti should be able to digest higher levels of protein and soluble carbohydrates than the rabbit. Therefore, it was suggested that agoutis should be fed on diets similar to that of rabbits but it should be lower in structural carbohydrates and higher in soluble carbohydrates and protein (Garcia, *et al.,* 2000). Baas, *et al*. (1976) reported that in captivity the agouti could be maintained on a commercial primate ration (8-12 biscuits), water *ad libitum* and 2 apples. This ration would provide an adequate source of vitamin C and would allow digital manipulation of the large biscuits.

Coprophagy

Brown-Uddenberg (2001) reported that the Agouti practices coprophagy (the eating of their faeces).

THE REPRODUCTIVE SYSTEM AND AGOUTI REPRODUCTION

Male Reproductive Organ

Male and female agoutis are easily differentiated **only** by physical examination of the external genital (Pictures 15a-15b and 16a-16b) The male's sexual organ, the **penis**, is posteriorly directed with an S-bend, which has to be straightened before erection could take place. The surface of the glans penis is covered with spines or spicules (Weir, 1974). The **prepuce** is visible and light digital pressure would cause the penis to protrude caudally (Baas, *et al.* 1976); Pictures 15a – 15b demonstrates the method used to identify the male agouti. The length of the penis is 10 cm. Its muscle consists of two levatores penises and two erectores penises. The former arise from the posterior margin of the os pubis close to symphysis. The two tendons run on the dorsum penis, and are inserted into the bone covering the dorsal aspect of the glands. The two erectores penis arise from the whole length of the posterior margin of the os pubis, and embrace the external aspect of the curs penis on each side, into the sheath of which they are inserted. The ejaculators seminis are large, and the urethra is very muscular. The glans penis is 3.13 cm in length, bifid at the end, and contains a spacious orifice. At the bottom of the orifice there are two small apertures: the anterior is the opening of the urethra; the posterior leads to a rugous canal about 1.9 cm in length. At the bottom of this canal, there are two osseous spurs, which by a muscular apparatus, may be protruded from the extremity of the penis. Externally the glans are studded with very fine bristles, both upon the lower and upper surfaces. From the lateral aspects of the middle half of the glans, there are two horny plates, serrated at their external margin, all the minute teeth point backwards (Jones, 1834).

The **testis** are barrel-shaped, 3.75 cm long and 1.25 cm in diameter. The testes are situated within the abdomen, in contact with the abdominal muscles, to which they are connected by a duplicature of peritoneum. The **epididymis** is contained in a pouch. It is attached to the testis by the apex of the triangle. The **vas deferentia** terminate at the sides of the verumontanum. The **vesiculae seminales**, 6.25 cm in length consists of a middle portion, into which sixteen or eighteen little appendices open. There are four prostrate glands, which would form the masses of the convoluted vessels. **The vesicular gland** provides the bulk of the accessory gland secretions and the fluid gels when mixed with prostatic secretions. This mixture tends to form a copulatory plug, which may be considered a useful indicator of mating. The preputial orifice is 2.75 cm from the anus (Jones, 1834).

Female Reproductive Organ

In the female agouti, there is a vaginal closure membrane, the **perineum**, which opens only at oestrus and parturition (Weir, 1971). At oestrus the perineum would be perforated for 1-10 days. The **ovaries** of the agouti are fairly large (207.1 ± 19.3 mg N=23). They are ovoid bodies, which lie by the posterior border of the kidney and are supported along their whole length by the mesovarium. The ovaries are composed of the following cells or tissue types: follicles, corpora lutea (CL), accessory CL, interstitial tissue, connective tissue and a well developed vascular system. The ovary of the agouti is characterised by the presence of a

large numbers of accessory corpora lutea and by the extensive interstitial tissue, which appear to replace the stroma of other mammals. Patches of "immature testis tubules" are found in the ovaries of many agoutis (Weir, 1971).

The descriptions of the microscopic findings of these cells or tissues are summarised in Table 12 (Weir, 1971). Little work has been done on the macroscopic anatomy of the female reproductive system. There is no ovarian bursa, although mesosalphix covers part of the ovarian surface. The **uterine tube** has a prominent cranial loop. The **uterus** is bicorunate and each horn opens separately through the large, solid cervix. The **vagina** is long and bends sharply ventral to the vulva where the closure membrane is found (Weir, 1971).

The female agouti has four pairs of **mammae**, two pairs in the thoracic region (axillary and pectoral) and two pairs in the abdominal region (abdominal and inguinal) (Baas, *et al.* 1976 and [Clark and Olfert, 1986]. Picture 16b shows the mammary glands of a lactating female agouti]. The anterior mammae appear to have become atrophied (Ramdial and Ramdial, 1974). Picture 16a demonstrates the method used to identify the female agouti, and the picture on the cover page shows the engorged mammary glands of the female about three weeks *pre partum*.

Large **anal glands** in both sexes are evidenced by slightly visible perennial swellings. They are the apparent origin of a strong musk-like scent used for territorial marking (Baas, *et al*. 1976).

Agoutis in the wild have been reported to breed throughout the year. For example, on Barro Colorado Islands young agoutis were seen every month of the year running around the forests. However, around March to July when there was an abundant supply of fruit even more baby agoutis were seen (Smythe, 1970 a & b). However, NRC (1991) reported that the agoutis seem to breed twice a year. In **captivity**, the agoutis were reported not to be rapid or prolific breeders (Clark and Olfert, 1986). However, in some zoological parks like the Lincoln Park Zoological Gardens, Chicago, agoutis within a breeding colony gave birth every month of the year. In the month of March and December an increase number of births was observed, with secondary peaks in September and October over an eight-year period (Meritt,1978). Similar experiences have been reported for the Agouti at the Zurich Zoo and the Basel Zoo in Switzerland over the last 50 years [1948 to 1988]. The latter observed 42 litters producing 89 young. Litter sizes were 22 x 1, 16 x 2, 11x 3, 4 x 4, and 1 x 6, with a mean litter size of 2.13 and a median of 3 (Dollinger *et al* 2001). This suggests that there is room for selection for litter sizes and fertility.

Table 12:
Notes on the Microscopic Anatomy of the Ovary of the Agouti (*Dasyprocta sp.)*

Cells or Tissue Types	Notes
Oocytes & Follicles	Primary follicles are found in the cortex of the ovary below the tunica albuginea. Antrum development occurs when the follicle is about 200u in diameter. The size of a ripe Grafian follicle can be as much as 1000u in diameter. The number of follicles ovulating appears to be 1-5. The follicle is surrounded by two thecal cell types. The typical theca externa cells are more predominant than theca interna cells. The latter exists as scattered cells in the theca externa, which is usually 50-100 u in thickness. Transformation of follicle into accessory corpora lutea by lutenization, or into interstitial tissue, may take place at cell stages in their development.
Corpora Lutea	These are developed from ovulated follicles of about 1000u in diameter. New CL retains a central lumen for a few days. The maximum size of CL observed at ovulation and at pregnancy is about 300u in diameter.
Accessory Copora Lutea	These are formed from unevaluated follicles. They are present in every ovary. Few were found in pro-oestrus agoutis, whereas more were found in agoutis that were, or had been pregnant.
Interstitial Tissue	This is the most striking feature of the ovary, formed fro m transformation of follicles.
Immature testis Tubules	Reported to occur at different sites in the ovary.
Papilloma	This bilateral structure is reported to occur. It may occupy 50-60% of the organ.

Source: Summarized from Weir, 1971.

Courtship Behaviour

Smythe (1970 a and b) and Kleiman (1974) described the agouti's courtship as being highly specialised. The courtship would begin in the attempt of the male agouti to approach the female. He would walk obliquely towards her, rear up on his hind legs, pivot towards her, erect his penis and squirt urine at her (a process called enurination), from a distance of up to about 1.5m. As he rears up, the female would usually jump out of his way. He would make squeaky noises at this time, and when he pauses, his front feet would be vibrated in a rapid trembling motion. Every time the female would pause to eat, to rest, or to groom he would attempt to get in position, to enurinate her. He would usually succeed on the second or third

try. When a male enurinated on a young female for the first time, she would go into a "frenzy dance." At first the female would ignore its occurrence, then after 15-20 seconds, she would begin to toss her head and to prance around. Then, she would jump up and start to run in circles. The male would then follow the female's action. The female would stop to groom herself or to eat; the male would attempt to get in position for another enurination. After receiving the first few sprays, the female would gradually allow the male to approach her more closely, until he would be able to crouch over her in the mounting position. After each enurination he would sit and tremble his forefeet. During the mating process the male's scrotum would become enlarged, and there would be a noticeable increased in his odour (Smythe, 1970 and Kleiman, 1974).

A copulatory plug composed of ejaculate would usually be formed in the vagina (Clark and Olfert, 1986). Males would attempt to mount the females regardless of her reproductive state, and would demonstrate pelvic thrusting. Unsuccessful mounting attempts would usually include erection of the penis followed by genital grooming. Females in oestrus that were being courted would respond to the male by assuming a lordotic position, thus exposing the vaginal closure membrane (perineum). Non-receptive females would be aggressive towards a pursuing male. The female has been reported to have a short period of sexual receptivity, which would last for only several hours. The male would attempt to mate. After copulation the female would rapidly revert to non-receptivity (Clark and Olfert, 1986).

Kleiman (1974) reported that the female agouti would give birth in a squatting position, and the newborn was precocious at birth and would normally weigh 210 grams. However, Roth-Kolar (1957) reported that at birth the young would weigh between 145-150g. Meritt (1978) reported that from the births at the Lincoln Park Zoological Garden Chicago, Illinois over a seven (7) year period, the male newborn agoutis averaged 258g with a range of 225-308g, and the female agouti averaged 272g with a range of 210-355g. Roth-Kolar (1957), reported that total body length of the newborn was 240 mm. The lengths of the different body parts were also reported, they were: the total body length was 95 mm, head length 40 mm, width of head 30 mm, upper arm length 50 mm, forearm length 60 mm, thigh length 50 mm, and foot length 60 mm.

The mother would nurse the young in an exposed area, in a lying or sitting position for 2-6 minutes with the young exhibiting a rapid alternation of teats. Young agoutis could eat solid feeds within a day or two of birth and could survive away from their mother in one or two weeks. The break up between mother and offspring (weaning) varied. There was a correlation between apparent weaning age and puberty. It was reported that the young agouti would reach sexual maturity late if they were weaned late (i.e., social weaning) regardless of when they could be weaned from milk (i.e., nutritional weaning). The degree of father-young interaction was partly dependent upon the female. Most female agoutis would exhibit aggression after birth and would drive off the male. However, when the male gets a chance (in the absence of the female) he would enurinate over the young. This would decrease the contrast in odour between himself and the litter (Kleiman, 1974).

Reproductive Features

The length of gestation of the agouti was reported to be variable. These included 44 days (Enders, 1931); 97 days (Asibey, 1984); 104 days (Brown, 1936); 105 days (Roth-Kolar, 1957); 109-123 days (Meritt, 1983 citing Fortes and Deutsch, 1972) and 115-120 days (Korz, 1991 for *D. punctata*) [Table 13]. Weir (1971), indicated that these figures have not been confirmed, but suggested that it would be reasonable to assume that gestation would probably last more than 100 days, as in most hystricomorphs except the *Caviidae* (Weir and Rowlands, 1974). The gestation length could be determined from calculation of the interval between an observed mating (or the finding of a copulatory plug, or the presence of spermatozoa in the vaginal smear) and normal parturition. It would not always be correct to assume that copulatory behaviour would represent impregnation.

Weir (1971) reported that in the female agouti, the perineum (the vaginal closure membrane) would be open at oestrus and parturition. At oestrus, the perineum was reported to be perforated for 1-10 days. Weir (1971), defined the length of an oestrus cycle as the interval from the first day of vaginal opening in one cycle up to, but not including the first day of opening in the next cycle. Weir (1971) reported that the mean length of twenty-nine (29) oestrus cycles in three (3) animals was 34.2 ± 2.1 days. The mean length of six (6) other cycles in the summer months was 87.2 ± 9.8 days, which was significantly longer than that of cycles at other times. From this it was assumed agoutis might have an annual anoestrus period. However, the data of Weir (1971) and Smythe (1970, a) have suggested an oestrus cycle of 34 ± 2.1 days. This seems to be inconclusive, as there appeared to be variability both within and between seasons, and between and within animals. However, Brown-Uddenberg (2001) reported that the agouti was not a seasonal breeder.

The agouti was reported to be a spontaneous ovulator (Weir, 1974), in which the corpus leuteum of the cycle was assumed to be functional through out the whole cycle (Weir, 1971). Weir (1971), also suggested that the agouti exhibited postpartum oestrus. Korz (1991) working with 4-6.5 year old *D. punctata* females reported the exhibition of *post partum* estrus. Roth-Kolar (1957) reported that he observed the male agouti would copulate with female agouti six to seven hours before they gave birth and regularly a few hours after birth. This is therefore an area of conflicting observation.

Table 13:
Reproductive Features of the Agouti (*Dasyprocta leporina*)

Characteristics		Source/s
Gestation length	97 days	[Asibey,1984.]
	104 days	[Brown, 1936.]
	105 days	[Roth- Kolar, 1957.]
	120 days	[Grizimek, 1975.]
	104-120 days	[Weir,1974.] [Clark and Olfert, 1986.] [NRC, 1991]
	D. punctata 101-110	[Meritt, 1983]
	5 *Dasyprocta sp.* 100	[Meritt, 1983]
	D. azarae 109-123	[Meritt, 1983]
	Dasyprocta sp. 112	[Meritt, 1983.]
Length of oestrus cycle	34 +/- 2.1 days with a range 12-59 days	[Weir,1971.]
Ovulation	Spontaneous?	[Weir,1974.]
Postpartum Oestrus	Exists?	[Weir,1974.] [Roth- Kolar, 1957.]
	For *D. punctata*	[Korz,1991]
Puberty	8-10 wks.	[Roth- Kolar, 1957.]
	9-10 months (male puberty)	[Assis-Neto et al 2002]
	6-8 mths.	[Weir,1974.] [Asibey,1984.]
	9 mths..	[NRC, 1991]
Sexual Maturity	6 mths.	[Roth- Kolar, 1957.] [Clark and Olfert, 1986.]
	2 years	[Weir,1974.]
	10-14 mths. [post-pubescent]	[Assis-Neto et al 2002]
Sex ratio (female to male)	1:01	[Roth- Kolar, 1957.]
	5:01	[Asibey,1984.]
Litter size	1. to 3.	[Weir,1974.] [Clark and Olfert, 1986.] [Asibey,1984.] [NRC, 1991.]
	2 to 4.	[Brown, 1936.]
	1 to 6	[Dollinger et al, 2001]
Litter/ year	2	[Clark and Olfert, 1986.] [Asibey,1984.]
Litter Interval	115-190 days	[Roth- Kolar, 1957.]
	120, 127	[Roth- Kolar, 1957.] [Meritt, 1983.]
Number of parturitions per year	2-3	[Korz, 1991.]
Birth Weight	151 g [80 to 195g]	[Dollinger et al, 2001]
Lactation period	20 weeks	[Roth- Kolar, 1957.] [Weir, 1974.]
	8 weeks	[Asibey, 1984.]
	3 to 5 mths.	[Clark and Olfert, 1986 .]
Weaning age	8 weeks	[Asibey, 1984 .]
	12 weeks	[Smythe, 1970 (b).]

Habitats and Housing

NRC (1991) reported that Agoutis' habitats were found from sea level to elevations of at least 2500m. The agoutis were also described as diurnal animals (Grzimek, 1975; Meritt, 1978; and Nowak, 1991). They lived in marshy woods near lowland rivers, as well as in the dry forests of plateau, on grassy riverbanks, in dense thickets, and in open savannahs and fields. They sometimes dig burrows under rocks, between roots of trees, or in sloping banks. They would also use hollow logs, holes in trees, stumps or caves. Nest chambers were made of leaves, twigs, roots, and hairs. A single animal occupied each burrow. In Trinidad, Ramdial and Ramdial (1974), reported that agoutis were seen under dense tropical rain forests (792m above sea level); semi-deciduous forests and shrub-type tertiary growth (68.6m above sea level); as well as in recently converted agricultural lands adjacent to forest areas.

Social Behaviour

The agouti has been reported to demonstrate some unique social behaviour Smythe (1970 a and b). These included **courtship (earlier described), vocialization, mechanical communication, comfort behaviour, allogrooming, autogrooming, protection against biting dipterans and sleeping.**

Vocalisation

The best-known vocalisation of the agouti would be the **alarm bark**. This sound would be made by an animal running at full speed and never by an animal sitting. The alarm bark would also be given if the agouti was suddenly surprised, for example by the rush of a predator (Smythe, 1970b). Agoutis would make a **purring sound** similar to that of a domestic cat. The purr was essentially a contact noise. Smythe (1970b), reported that agoutis would purr at these following times:

(1) by a nursing mother when arriving at the nest; or while being groomed by a juvenile; upon picking up a piece of food while foraging with a juvenile; or when a juvenile takes a piece of food from her mouth;
(2) by a juvenile when being groomed by the mother, or during naso-nasal greeting of the returning mother;
(3) by adults when being closely approached by their mate; when being groomed by their mate; or when picking up a piece of food after searching some time for it.

A juvenile that was temporally out of contact with its mother, or was following her as she walked along, would make a noise, described as the **creak-squeak**. This noise was also made by a subadult, which failed to move out of the way of an approaching adult until it rushed them. An adult male also made this noise when approaching a female to enurinate on her. The frequency of the sound appeared to increase with the number of times she avoided him (Smythe, 1970b).

Agoutis would make a short grunt called the **fight grunt**, when pursuing another. Animals that made fight grunts would usually have the rump hairs raised to its maximum height. A trapped, wild agouti sometimes would make a very deep rumbling sound when approached. This sound is normally of a very low frequency and is called the **rumble**. Between bouts of

an aggressive encounter, agoutis would utter a **growling** noise that would sound like the growling of a very small dog. A female would utter the same sound when an animal attempted to dig her young out of the nest. Agoutis of all ages would make a **distress scream**, which, was similar to that of a rabbit, when a predator actually caught them (Smythe, 1970b).
Mechanical Communication

Agoutis are reported to exhibit **thumping** behaviour in response to an unfamiliar stimulus. Thumping would also be seen when an agouti ventured into an area where another agouti was dominant. Sub-adult males, that were beginning to show some aggression to other agoutis would sometimes thump after they have been driven off by a dominant animal (Smythe, 1970b). A sexually aroused male agouti would thread rapidly with his forefeet, this is also known as **drumming with the forefeet** (Kleiman, 1974). Agoutis would make a **chattering noise** with their teeth during agnostic encounters, usually between bouts of fighting. When gnawing at a hard seed the agouti would make a loud rasping noise that could be heard for 50m or more (Smythe, 1970b).
Comfort Behaviour

Smythe (1970b) reported that the agoutis displayed characteristic behavioural patterns, which he described as "comfort behaviour."

Allogrooming
Female agoutis would display allogrooming whilst grooming their young. Some allogrooming may occur between members of a pair, but agoutis would generally be classed as "distance animals" (Symthe, 1970b citing Heidiger, 1955:66).

Autogrooming
Autogrooming is often done by agoutis in an attempt to remove ectoparasites. When grooming themselves, the agoutis would sit on their haunches and would use their forelimbs and incisors to manipulate the hair of the ventrum and flanks. The forefeet would be used to rake the hair and to draw it within reach of the incisors, which are then used as a comb. The top, the sides, and the back of the head would be groomed with the forelimbs, which are used either singly or together between each sweep of the forelimbs. The animal would lick the inside surface of the wrists, where there would be a small oval patch of skin, which bore fine bristles. These short bristles would appear to function as combs to remove the ectoparasites. Agoutis would often scratch themselves with the hind claws. This would normally be done when the animal was in a sitting position, and occasionally whilst standing. Each claw would be cleaned with the incisors after a bout of scratching (Smythe, 1970b).

Protection Against Biting Dipterans
Smythe (1970b) indicated that mosquitoes and tabanid flies would often cause a great deal of discomfort to agoutis. The most vulnerable areas would be the pinnae, the rhinarium, the perineal region and the extremities of the hind limbs. In response to biting insects, the agouti would twitch their pinnae rapidly back and forth. When bitten on the rhinarium, agoutis would wipe at it with either forepaw and they would often do this while walking

along, hardly breaking a stride. When the insects were abundant, agoutis would sit in such a way that the perineum was pressed close to the ground. When insects were biting their hind legs, the agoutis would lift their foot off the ground and would give it a quick flick. If the biting persisted, they would sit down and would attempt to bite the insect or the spot where it was biting (Smythe, 1970b).

Sleeping

Smythe (1970b) reported that agoutis would commonly lie on the ventrum, with the forelegs folded so that the feet were under the chest. This posture would expose a minimum amount of the areas commonly bitten by insects, and may be adopted for that reason. Agoutis in captivity, housed in insect-proof cages, usually would lie flat or curled on one side to sleep. When awaken, the agoutis would stretch by first arching the back while stretching the legs, then stretching the forelegs alternately forward, often while yawning and finally would take a step forward while extending a hind leg stiffly to the rear. Stretching was often followed by a bout of grooming before the animal leaves the spot.

RESTRAINT AND HANDLING

Because of the unavoidable risk involved in handling animals, good judgement and the use of protective devices are essential. Clark and Olfert (1986) recommended that the **physical method** of restraint should include the use of leather gloves, wire or metal cones or tubes, transfer boxes, padded forceps, nets and traps for method of restraining an agouti. These devices would also protect against the possible transmission of zoonotic diseases. Wiltshire (undated) suggested that a good strong net with a handle could be used to catch the agouti .The net should be deep enough to restrain the animal. The agouti could also be restrained by holding it by the scruff of the neck and at the same time, securing its rump and hind legs to prevent spinal and hip injury (Pictures 17 & 18). Other simple techniques for restraining animals are presented in Pictures 19 to 22.

Baas, *et al*., (1976), reported that a good **chemical restraint** and analgesia for agoutis is Ketamine HCl (42-88 mg/kg, intramuscularly). Phencyclidine HCl, xylazine HCl and fentanyl-dioperidol are sometimes used as sedatives but are unreliable and are often associated with adverse side reactions.

HAEMATOLOGY AND SERUM CHEMISTRY

The cell count and calculated values of the agouti were reported to be similar to those of the guinea pig and the rabbit except for the elevated eosinophil component. The ensinophils present was characterised by pronounced granules and large nuclei. The haematological values and the serum chemistry values which were obtained from agoutis were outlined in Tables 14 and 15 respectively (Baas, *et al.*, 1976).

Table 14: Haematological Values of the Agouti (*Dasyprocta sp*.)
(n=10)

	Range	Mean	SD
Erythrocytes (10^8/mm^3)	5.4-7.8	6.7	0.2
Haemoglobin (g/dl)	11.7 - 15.8	13.9	1.1
Packed cell volume (%)	40.0 - 53.0	47.8	3.4
Mean corpuscular volume (u^3)	60.0 - 79.6	71	6.9
Mean corpuscular haemoglobin (uug)	18.4 - 22.8	20.6	1.5
Mean corpuscular haemoglobin concentration (%)	28.0 - 30.0	28.7	1.5
Leukocytes (10^3/mm^3)	5.6 - 9.5	6.8	1
Band cells (10^3/mm^3)	0.06-0.47(1-7%)	0.24 (3. 3%)	0.12 (1.8%)
Neutrophils (10^3/mm^3)	1.91-4.85 (29-62%)	3.37 (47.1%)	1.01 (12.2%)
Lymphocytes (10^3/mm^3)	1.87-4.66(30-50%)	2.98 (41%)	0.95 (8.1%)
Eosinophils (10^3/mm^3)	0.095-1.31 (1-17%)	0.43 (6.1%)	0.41 (5.3%)
Monocytes (10^3/mm^3)	0 - 0.38 (0-5%)	0.12 (1.8%)	0.01 (1.7%)
Basophils (10^3/mm^3)	0 - 0.11 (0-2%)	0.04 (0.6%)	0.05 (0.8%)

Source: [Baas, *et al.*, 1976.]

Table 15: Serum Chemistry Values of the Agouti (*Dasyprocta sp.*)
n=10

	Range	Mean	SD
Calcium (mg/dl)	8.0 -10.8	8.7	0.7
Inorganic Phosphorous (mg/dl)	2.6 - 5.0	3.8	0.9
Glucose (mg/dl)	156.0 - 250.0	199	40.6
Blood Urea Nitrogen (mg/dl)	4.0 - 8.0	5.3	3.6
Uric Acid (mg/dl)	1.2 - 2.6	1.8	1.1
Cholesterol (mg/dl)	50.0 100.0	86.3	14.2
Total Protein (g/dl)	6.0 - 7.2	6.6	1.2
Albumin (g/dl)	5.3 - 5.9	5.6	0.2
Globulin (g/dl)	1.8 - 2.2	2	0.3
A/G Ratio	2.5 - 3.3	2.4	0.5
Birlirubin (mg/dl)	0.2 - 0.2	0.2	0
Alkaline Phosphate (units)	62.0 - 120.0	82.6	59
LDH (IU)	90.0 - 172.0	121	30
SGOT (IU)	46.0 - 90.0	74	15

Source : [Baas, *et al.*, 1976.]

Part 4

The Agouti Production Manual

HOW TO GO ABOUT SETTING UP AN INTENSIVE AGOUTI PRODUCTION SYSTEM

Now that we have presented you with what is known about the Agouti we would like to outline for you the philosophical basis used in approaching or developing intensive animal production system. This approach is based on two pillars and they are:

1] an understanding of the **factors affecting animal production** and
2] a knowledge of the **physiological states** of the animal species in question.

We would like to indicate to you at this point that there is an interaction between the above two; and this interrelationship will determine the nature of the production system. The reason for this is that at each physiological state the effect of each factor is different
OR the needs of and the threats to the animals' survival will be different.

THE PILLARS TO CONSIDER

The Factors Affecting Animal / Livestock Production

There are five (5) factors affecting the production of any animal species. They are:

1. Housing and the Environment: Comfort needs,
2. Nutrition and Feeding,
3. Breeding and Reproduction,
4. Health and Disease and
5. Economic and Socio-economic considerations.

The review was organized around the first four factors listed. The factors affecting livestock production can be further simplified as follows:

1. **Environment [The housing and Animal Welfare System]**
2. **Nutrition [The Diets which are put into a Feeding System]**
3. **Genetic [Breeding and Reproduction System]**
4. **Health [Disease Prevention and Management System]**
5. **Economic and Marketing**
   [The Animal Products Harvesting and Marketing System]
   Cost and availability of Land
   Cost of animal inputs
   Cost of non animal inputs
   Market price of the Products Produced.

The first factor is god given, but science and management could be used to help the animals perform and produce efficiently within the given environment. The next three factors (these are the animal or biological factors) can be easily controlled or improved through scientific research and improved management at the farm level. The fifth factor, however, is the one which determines the profitability and ultimately the economic sustainability of the production system. This however is not always under the direct control of the farmers or producers.

What is " a" or " the" Physiological State of an animal?

Before we attempt a definition it is essential that we first put **the animal** in question into perspective. We shall first need to know the following about the animal:

- the species
- its' sex
- is it in early growth?
- is it in late growth?
- is it undergoing puberty
  [the changes necessary for going into the reproductive phase of life] ?
- is the animal being prepared for reproduction?
- what is its' reproductive state?
- what is its' productive state (or growth state or desired growth rate)?
- is it a working animal and what type of work is it doing ?
- what is the weight of the animal?

The physiological state of an animal can be seen therefore as a description of an individual animal or similar animals within a species, from the standpoint of their stage in their life cycle or productive state. This would then indicate to the animal manager or production facility developer what **the animals'** needs would be for:

- Nutrients
- Housing and Environmental comfort
- Disease prevention
- Reproductive management and
- Harvesting and Marketing the animal products.

Each physiological state of an animal creates different types of demands for the animals' comfort, well-being, and productive capability. This is in response to the animals' immediate needs for maintenance, growth, production (eggs, milk, plumage), work and reproduction.

The effect of the Factors Affecting Animal Production on Wild Animals Reared in Captivity:

In the wild the animals live within a habitat. In this habitat
- they have a place to live and are kept comfortable **(housing)** ,
- they get their food **(nutrition and feeding)** ,
- they are able to make their nests or reproduction sites for caring for their young and they are able to locate suitable mates **(breeding and reproduction)** and
- they are free to move within their habitat and are able to avoid diseases and predation **(disease prevention and control)**.

Therefore when wild animals are kept in captivity all of the above have to be provided, so that the keeper of these captive animals now has to ensure that all the functions performed by the habitat will now be provided for within the new captive environment.

Intensive Animal Production Systems:
We would now like to turn your attention to the concept and practice of intensification and it requirements and consequences.

Intensification
This involves the bringing together of many animals in a single location or in close proximity to each other with consequent problems due to increasing animal population densities.

Features of intensification
- use of limited land
- high animal to land ratio
- high levels of technical and managerial inputs are required
- variable quantities of capital outlays are required
- very labor demanding or may need forms of automation
- expected product output required.

The Implications of Intensification on Production
- Animals have to be fed and watered with timely waste removal.
- Preventive techniques have to be instituted to avoid the introduction and rapid spread of diseases.
- Animals' social behavior need to be considered and provisions made for the animal social needs to be met.
- The design of the housing plays a key role in facilitating all of the above.

The Role of Housing and Equipment under intensive systems of production
The role or housing and equipment under intensive systems of production are as follows:
1] to protect the animal from the environment and predators;
2] to ensure the timely and controlled supply of feed nutrients and water;
3] to exclude disease causing organisms and to eliminate or minimize the possibility of and spread of diseases;
4] to protect the animals from trauma;
5] to protect man and to facilitate the ease of handling of animals through :
   a) special features and considerations for handling , restraint and treatment of animals ,
   b) having the animals arranged into different physiological states;
6] to facilitate timely and efficient removal of waste;
7] to enable the grouping of animals into manageable units which could make the easy observation of animals individually;
8] to enable the easy handling of animals for either product collection (e.g. eggs) and or the sorting of animals for marketing;
9] to modify the environment to alleviate any stress which would be constraints to productivity; and
10] to provide specialist type of equipment to facilitate slaughter and processing.

Key elements of livestock housing under intensive conditions

1] Water Supply
2] Power Supply
3] Enclosure, Housing and or Handling Requirements based on species needs.

APPROACHES AT DEVELOPING ANIMAL PRODUCTION SYSTEMS/ CONCEPTS IN DEVELOPING INTENSIVE ANIMAL SPECIES PRODUCTION MODELING

In this section you will be exposed to those concepts and considerations which must be used when designing ***any*** **"Animal Production System"**. This information would be important as one day you may be asked to design a system without all the system's components being known. What you should then try to do is to gather all that is known about a more popular related species within the same family as follows:

- the nature of the digestive system
  [Digestion and Feeding]
- the nature of the habitat and nesting sites of the species under consideration
  [Housing and Environment]
- the reproductive system and habits
  [Reproduction and Breeding]
- the social habits
  [Animal Behavior]
- diseases which affect the species
  [Disease Prevention and Control]

Further considerations...

- The **objectives** of the production system must be clearly identified, established or known from the start in order **to identify which physiological states** would have to be included in the production model or system.
- The **source of the animals** for the production system to be established will also need to be identified as follows:
  - wild Caught Captive Breeders,
  - wild caught juveniles for growth,
  - management of all physiological states,
  - other?

CONSIDERATIONS FOR SPECIES PRODUCTION MODELING

The block diagram on this page presents a list of the **Important Considerations** for modeling the production of any species. Figure 1 presents the **Concepts for Developing an Intensive Animal Production System for any species.**

Box 1:

CONSIDERATIONS FOR SPECIES PRODUCTION MODELING

The Species:

[I] **The Objectives of the Production System or Model**

[II] **The Species Life Cycle**

[III] **The Physiological States for the Production Flow**

[IV] **Performance Coefficients or Growth Parameters**

[V] **Reproductive Parameters**

[VI] **Animal Specific Needs as influenced by the Factors Affecting Animal Production**

Needs:
- **Housing-**
- **Nutrition and Feeding-**
- **Health and Disease Control-**
- **Reproductive Management-**

[VII] **Animal Behavior and Sociology**

[VIII] **Design of the Physical Environment Required**
- **Thermal Environment [LTC, UTC, TNZ]**
- **Ventilation**
- **Humidity**
- **Air Quality**
- **Housing System**

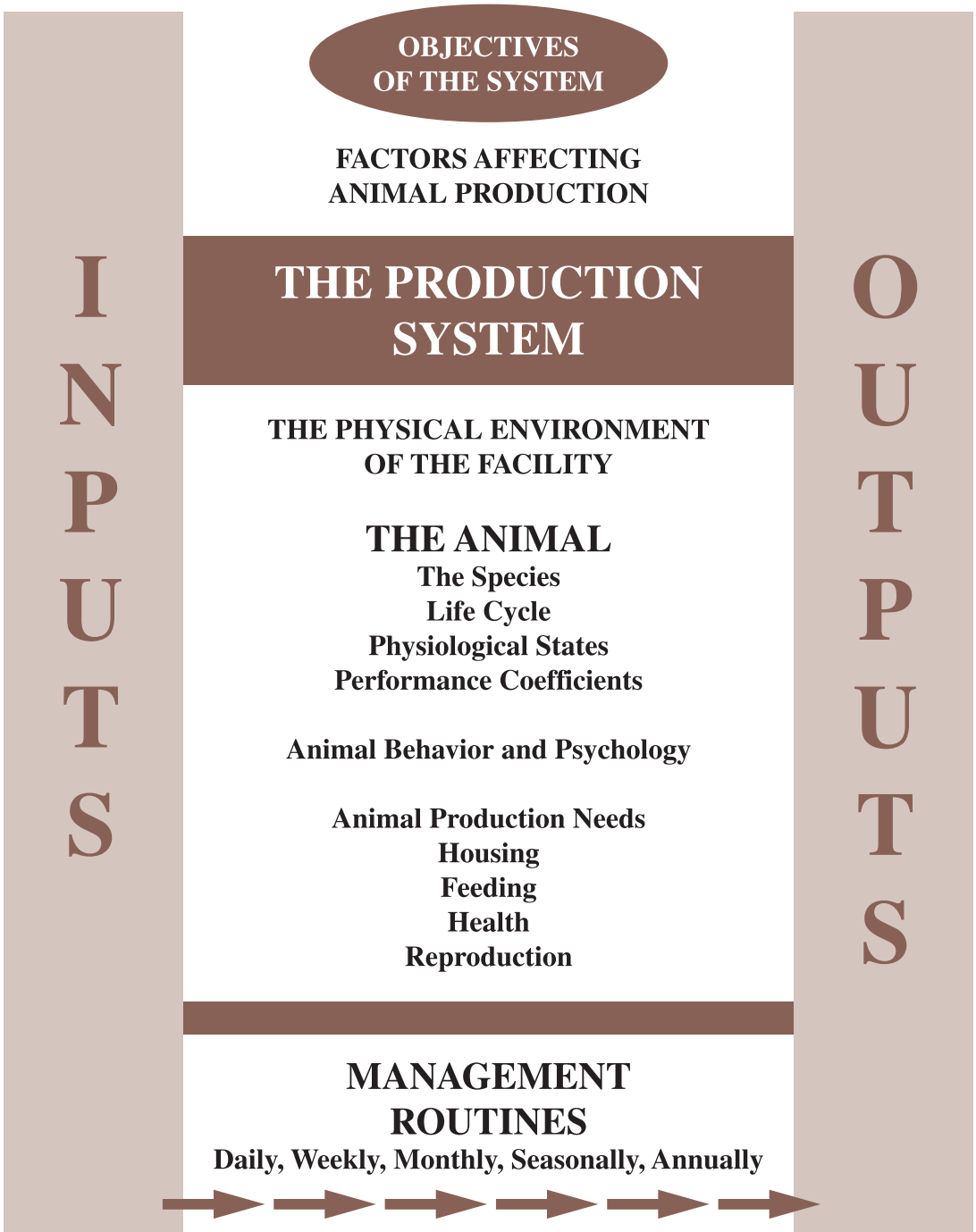
[Space requirement; Trucking and Transport Considerations; Floor and Floor Surface type]

[IX] **Management Routines Required**
- **Daily**
- **Weekly**
- **Monthly**
- **Seasonally**
- **Annually**

[X] **Variable Inputs Required**

[XI] **Output Expectations of the Model/ Production Process Flow**

Figure 1:
Concepts for developing an animal production system for any species.

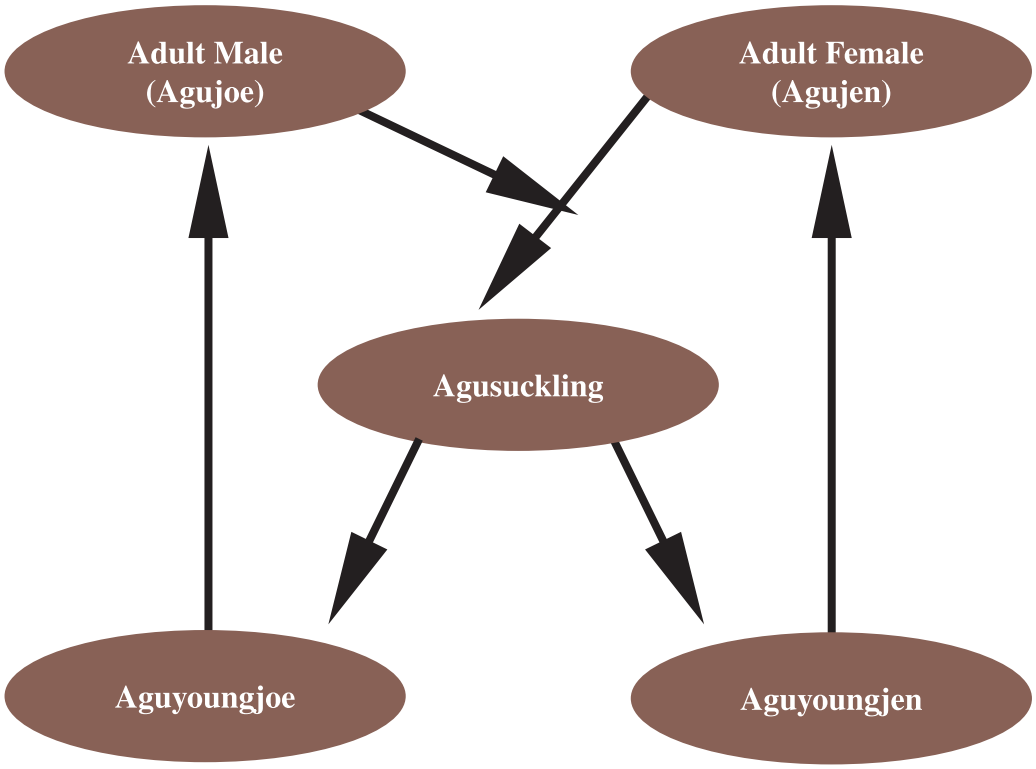


THE OBJECTIVES OF THE AGOUTI PRODUCTION SYSTEM

In order to develop your Agouti production system you must first begin with the end in mind, i.e. what are the objectives of your production system and what products or animals are you going to sell. This would determine what you do.

THE LIFE CYCLE OF THE AGOUTI

Figure 2: The Life Cycle of the Agouti



THE PHYSIOLOGICAL STATES OF THE AGOUTI

Breeding Females [**Agujen**]
Breeding Males [**Agujoe**]
Suckling Young Agouti [**Agusuckling**]
Young Growing Post Weaning but Sexually Immature Females [**Aguyoungjen**]
Young Growing Post Weaning but Sexually Immature Males [**Aguyoungjoe**]
Sexually Mature Females [**Replacement Agujen**]
Sexually Mature Males [**Replacement Agujoe**]

PRODUCTION UNITS

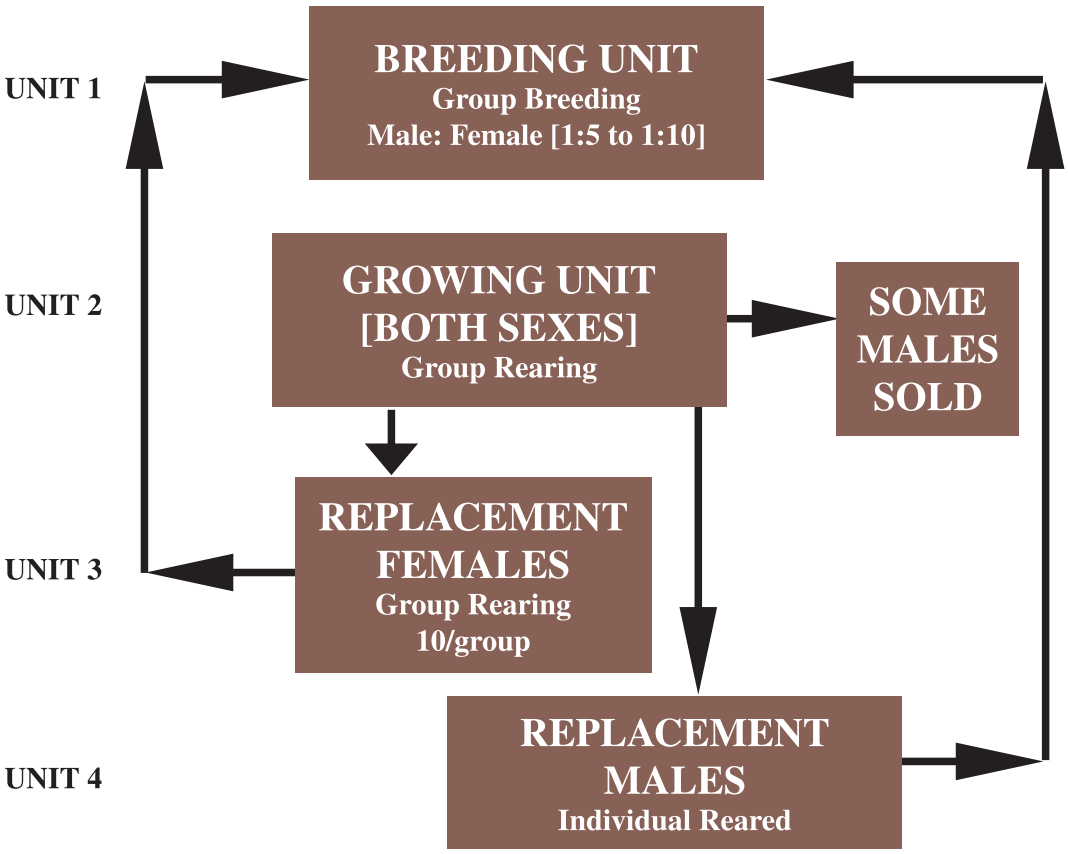
Unit 1: **Breeding Unit [Group Housing]**
Breeding Females [Agujen]
Breeding Males [Agujoe]
Suckling Young Agouti [Agusuckling]
Ratio of Agujoe: Agujen = 1:5 to 1: 10

Unit 2: **Grow Out Unit [Group Housing]**
Young Growing Post Weaning but Sexually Immature Females [Aguyoungjen]
Young Growing Post Weaning but Sexually Immature Males [Aguyoungjoe]

Unit 3: **Replacement Females Unit [Group Housing]**
Sexually Mature Females [Replacement Agujen]

Unit 4: **Replacement Breeding Males [Individual Cages]**
Sexually Mature Males [Replacement Agujoe]

Figure 3:
Agouti Production Units Process Flow



You would therefore have to decide on the primary objective of your Agouti Production System. Would it be for selling weaners [8-12 weeks], fatteners [12 to 16 weeks], or breeding stock 9 to 12 months old? Based on your decision you will then know which production units you will need to have.

FEATURES OF HOUSING FOR AGOUTI

The **Main Housing elements for the intensive production of Agouti** are as follows:

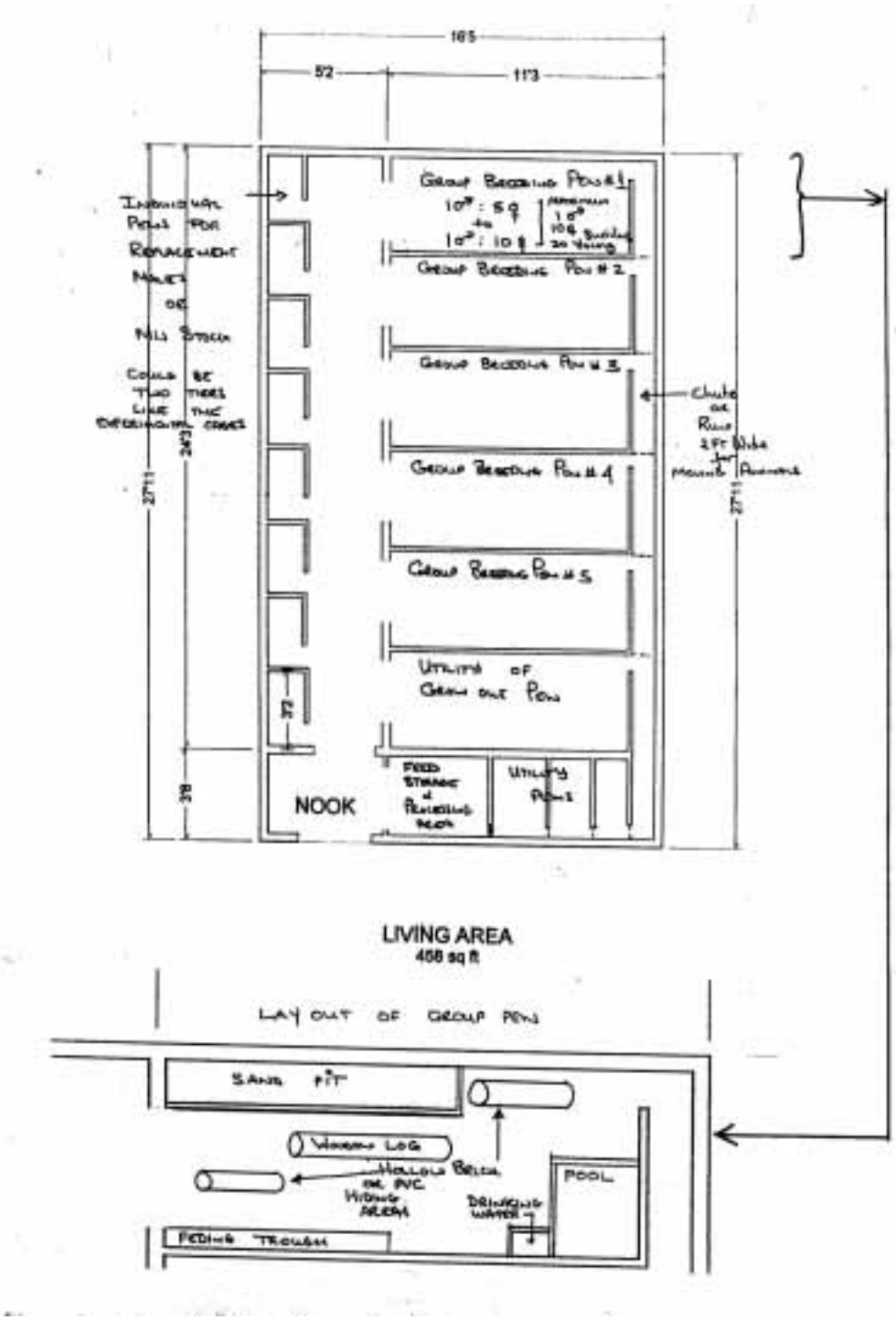
- Hiding Areas for the newborn and young
- Clean water supply daily
- Shallow ponds for soaking their feet during the day
- Sand pit for digging and hiding food
- Good Ventilation
- Good Animal Visibility
- Secure gates
- Rodent Control and Prevention of Entry of Large Rats which would attempt to carry away weak young [this can be done by enclosing the Breeding Unit with 1 inch square wire];
- Control of Snakes and the height of the walls from the ground could be as high as three (3) feet, to minimize the incidence of escape when a human is entering the pen, and to minimize the entrance of dogs.

Professor Thomas Henderson of Dominica has developed an Agouti house with most of these features.

Picture 23 presents an experimental or caged housing system, similar to that for caged rabbit rearing.

Drawing 1 is a conceptual floor plan for an intensive agouti production unit.

Drawing 1:
A Proposed Floor Plan for Unit 1:Breeding Unit [Group Housing]



PRACTICAL AGOUTI RESTRAINT

Agouti restraint and handling techniques as reported in the literature earlier were presented in Pictures 17 and 18. Pictures 19 - 22 demonstrates some restraining techniques developed by Mr. Michael Ramrattan of Marabella . These techniques are very simple and practical and the cages were made of 2x2 square BRC wire. The method was designed to achieve the following:

1. to secure the animal easily so that you would not be bitten or scratched,
2. to prevent the animal from being touched during handling,
3. to facilitate close range observation,
4. to gain easy access to wounds and apply medication and
5. for security and ease in transporting animals.

BACKGROUND TO THE AGOUTI PRODUCTION MODEL

The work of the Intensive Agouti Production Unit in of the **Open Tropical Forage-Animal Production Laboratory [OTF-APL]** at the University of the West Indies Trinidad, Trinidad and Tobago, and reported on by Brown-Uddenberg (2001) gathered the following information for the Intensive production of the Agouti.

1] Agoutis could be intensively reared.

2] Agoutis **are not** seasonal breeders.

3] Agoutis could be reared and reproduce successfully in rabbit sized cages, open enclosures or large cages [semi-intensive] or large enclosures with trees [extensive].

4] Agoutis could be weaned at eight weeks; showed signs of sexual maturity at 13.5 to 14.5 months and a female agouti could produce her first litter at 17-18 months.

5] Agoutis could be managed in a group breeding system, with the males continuously present with the females and suckling animals *pre-* and *post partum*; but the animals must not be stressed for food or space, and ample hiding and private places must be provided for the young; [this is because the males are the best detectors of estrus and the signs of estrus in the agouti female is not yet known].

6] Agouti breeding groups could be one (1) male to at least five (5) females, but the upper limits of the male to female ratios have not yet been determined but male: female ratio of 1:9 or 1:10 should be possible.

7] If Agouti males are limiting, a male could be left with a group of females for at least 20 to 36 days to ensure conception of all the females in that breeding colony.

8] If Agouti males are limiting in an ongoing breeding operation the males should be introduced into a colony of **pregnant females** [but the males must be slowly introduced to the females] at least one [1] to two [2] weeks ***pre-partum*** and then be left there for between **20 to 36 days *post partum*** to ensure conception; This latter method is a bit tricky as the females or the newly introduced male may show signs of aggression towards each other.

9] Care must be taken when introducing new males or other animals into a group, they must be slowly exposed to the group by placing the new animal into an adjacent pen or into a smaller pen within the larger pen, so that they become accustomed to that animal through sitght and smell.

10] When females within the group are observed pregnant, by the distention of the teats, **Cover page** and **Picture 16b**, they could be placed into a portable smaller pen within the larger pen for parturition and in order to ensure identification of the litter size and the animals within the litter.

11] Our observations suggest that the Agouti would go into oestrus [heat] while lactating.

12] Sex determination in agoutis involves physically restraining the animal, followed by applying digital pressure in the region directly anterior the urethra and anus respectively; the protrusion of a cylindrical structure represented the penis of the male Agouti, and no protrusion indicated that the Agouti was a female [Pictures 15a -15b.

13] The manifestation of external signs of pregnancy included the protrusion of two pairs of teats in the thoracic region two weeks prior to parturition; and the noticeable decrease in appetite the day before parturition.

14] **Agoutis are not generally prolific breeders**, because the female agoutis would give birth to an average of 1.25 litters per year (with a range of 1-2); with an average of 1.7 offspring being produced per litter (with a range of 1-3); however three (3) litters / year is possible with efficient breeding management and there is scope for improvements in litter sizes [from 1.7 to 6] through selection.

15] Agoutis practiced coprophagy like the rabbit and the guinea pig.

16] Agoutis practices food hoarding in the caged environment.

17] After prolonged and continuous exposure to Agouti some people may develop an allergic reaction which involves watering of the eyes, sneezing or allergic type upper respiratory tract conditions.

18] Female Agouti like many mammals also eat the "after birth" after parturition.

19] No major disease problems are encountered with the intensive rearing of the Agouti, the only health problems encountered are those associated with trauma and infection due to fighting or the attacking of young by adult Agoutis.

In all instances the Agouti species being referred to is the *Dasyprocta leporina*.

TARGET PERFORMANCE COEFFICIENTS

The results of our work have produced some production performance parameters, which could be used as "Target Performance Coefficients" for the intensive production of agoutis. These "Target Performance Coefficients" should give the agouti production model some level of predictability [Table 16].

Table 16:
Target Performance Coefficients for Agoutis

Age of Sexual Maturity	13-14 months
Age at First Litter	17-18 months
Breeding	Year round
Length of Gestation	104-112 days
*Postpartum Oestrous	To be verified
Number of Offspring per Litter (litter size)	2 (range 1-6)
Minimum Number of Litters per Year per Female	1.25 (range 1-3)
Number of days between successive parturition (parturition interval)	124 to 148 days [20+104] to [36+112]
Number of days between Union of Males and Females to Conception	Individual breeding: 20-36 days Group breeding: 1-19 days
Number of parturitions / year	1-3
Birth Weights: **Male** **Female**	307.40 g 288.12 g
Birth Lengths: **Male** **Female**	21.90 cm 22.44 cm
Weaning Age	8 weeks
Weaning Weight: **Male** **Female**	1096.80 g 1199.70 g
Weaning Length **Male** **Female**	29.80 cm 32.40 cm
Mortality Rate: Offspring	15.5 %
Mature Agoutis	10.8 %

A feasibility study of Agouti Farming in Trinidad and Tobago was done in 1986 by Miller and Miller (1986). This was done based on farmers' experiences with the Agouti in Trinidad and Tobago. They suggested a male: female ratio of 1:9, and assumed two litters /year / female, with a litter size of two. Out of this only males were to be sold for the first three years. The suggested opening stock was 26 males and 255 females.
Their financial calculations suggested a negative cash flow for the first three (3) years. Their animal projections seemed feasible based on the observed and calculated litter interval of 163.

SOME HUSBANDRY PRACTICES AND GUIDELINES

1] Practical Agouti Housing

- Avoid using wood as structural or enclosure elements.
- Always attempt to have logs 10 to 20 cm in diameter within the enclosures so that animals would have an item or items on which to work the agoutis incisors.
- The height of the housing could be about 6 feet, and the walls could be about 3 feet high.
- Water Supply:

  Drinking Water Containers
  - should be narrow so that only their head will fit and the rim should be about 3 to 4 inches from the ground;
  - should be easily cleaned;
  - should not be easy for the animal to be immersed in the water;
  - filling should be semi-automatic to minimise labour requirements for daily routines;
  - must not be made of plastic, but could be of very thick polyvinylchloride.

  Water Ponds within the pen
  - should be about 15 to 30 cm square as the animals like to cool their feet in it;
  - should be only 3 to 6 cm deep to avoid young and new born from drowning;
  - should be easily cleaned;
  - filling and cleaning should be semi-automatic to minimise labour requirements for daily routines;
  - must be made of cement.

- Sand Pits:
  - should be about 15- 30 cm square;
  - should be 6 to 10 cm deep;
  - should be filled with sand.

2] Practical Agouti Feeding

- avoid feeding dusty materials;
- fruits should be cut up;
- do not discard the seeds of the fruits, the Agouti will eat the seeds, whole dried coconuts are good;
- occasionally once per week a small amount of cod liver oil should be added to the feed, this is a good source of vitamin A, and should be done especially if the animals are fed pelleted feeds;
- the generalized Agouti Diet should look like this
  a. Starchy or Sweet Fruit or Vegetables in Season
  b. Mono-gastric Animal Pelleted Feed e.g. Pig Grower Pellets [this contains about 14 to 16% Crude Protein and is low in Fibre]
  c. Any type of Seeds or Dried Peas
  d. Drinking Water must be available at all times
  e. Molasses Water [1 molasses : 3 water] or Brown Sugar Water Solution.

3] Breeding and Culling Practices

- As the production system will be based on the group breeding system, it is IMPERATIVE that ALL AGGRESSIVE young and adult males be culled. As soon as signs of aggression are observed remove the animal from the group.

4] Health and Disease Prevention [Daily Routines]

Daily Observation of Animals:

- Observe for sick animals
- Observe for changes in stool / faeces texture
- Observe for animals with wounds and treat as soon as possible
- Observe for signs of pregnancy through engorged teats
- Observe for the onset of parturition
- Observe for animals going off feed
- Ensure water supply is clean and adequate
- Observe the Breeding Males for any signs of abnormalities around the reproductive areas.

Daily Feeding of Animals:

- Ensure a good daily feeding routine
- Cleaning of pens and feed containers

Daily Observations of Pens:

- Look for signs of rodents becoming pests
- Look for signs of entry of snakes and other predators
- Make sure that feed containers are secure and prevent pests from gaining access to the feed

Monthly Routines

- Prepare new pens for incoming weaned or adult animals

Seasonal Routines

- Keep in touch with other Agouti farmers for purposes of
- Sharing information and experiences
- Exchanging Breeding Males [Avoid using males on their daughters].

Need for Chewing Items within the Cages or Enclosures

As stated earlier, this could be logs, but could include dried coconuts, or pieces of wood.

SOME COMMENTS ON WHAT RESEARCH THAT STILL HAS TO BE DONE WITH THE AGOUTI

Further research is needed to determine the limited space requirement needed for an intensive production system, which would not have a negative effect on the offspring survival rate. Further work is also needed to design water and feeding systems, which would minimise the daily labour requirement of the intensive production system.

There is also the need for research to be done on the nutrient requirement and ration formulation of the agouti at given levels of production and physiological states. In addition, the feeding values of the feeding stuff to be used in the formulation of a ration for the agouti should also be investigated.

Using first principles in animal production an intensive production model for the agouti and a modified version of it was conceptualised and partially tested and the results have been presented to you in this booklet along with other information on the Agouti. Not withstanding that the model was tested, there is still the need for hormonal studies to be done to support the empirical reproductive observations made. Hormonal studies are also needed

1. to further investigate and confirm the occurrence and timing of postpartum estrus in agoutis;
2. to confirm the assumed length and nature of the agouti's oestrous cycle, and
3. to be able to develop an easier method for detecting of estrus in agouti.

The only method that exists for estrus detection in Agouti is the observation of perforation of the vaginal opening (Weir, 1971), which is difficult to detect by the untrained eyes and without restraining the Agouti. Extensive research was done on the microscopic anatomy of the female agouti's reproductive system. However, very little or no work was done on the macroscopic anatomy of the female reproductive system of the agouti. There is also the need to do work on the factors affecting litter size, and for genetic selection for large litter sizes [>3]. This is an area in need of urgent research. Finally it recommended that rearing and breeding cooperatives should be established to encourage the sharing of information and breeding animals, and we would like you to take up the challenge of starting a virtual Agouti Producers Club with the production of an Agouti Newsletter on the net.

Picture 3:
Dasyprocta leporina [Brown Body with Golden Rump from Gary Garcia OTF-APL, UWI, Trinidad, Trinidad and Tobago]

Picture 4:
Juvenile Female, Adult Female, and Juvenile Male shot in The Mora Valley Forest, Trinidad [Colors Olive Brown, Redish Brown (Golden Rumped or Red Rumped) and Olive Brown]

Picture 5: Adult Female caught in The Mora Valley Forest, Trinidad [Colors Redish Brown], showing rump hair details.

Picture 6: *Dasyprocta leporina* [White from Desmond James, Trinidad, Trinidad and Tobago]

Picture 7: ***Dasyprocta leporina*** [White and White body and Brown Rumped from Desmond James, Mausica, Trinidad, Trinidad and Tobago]

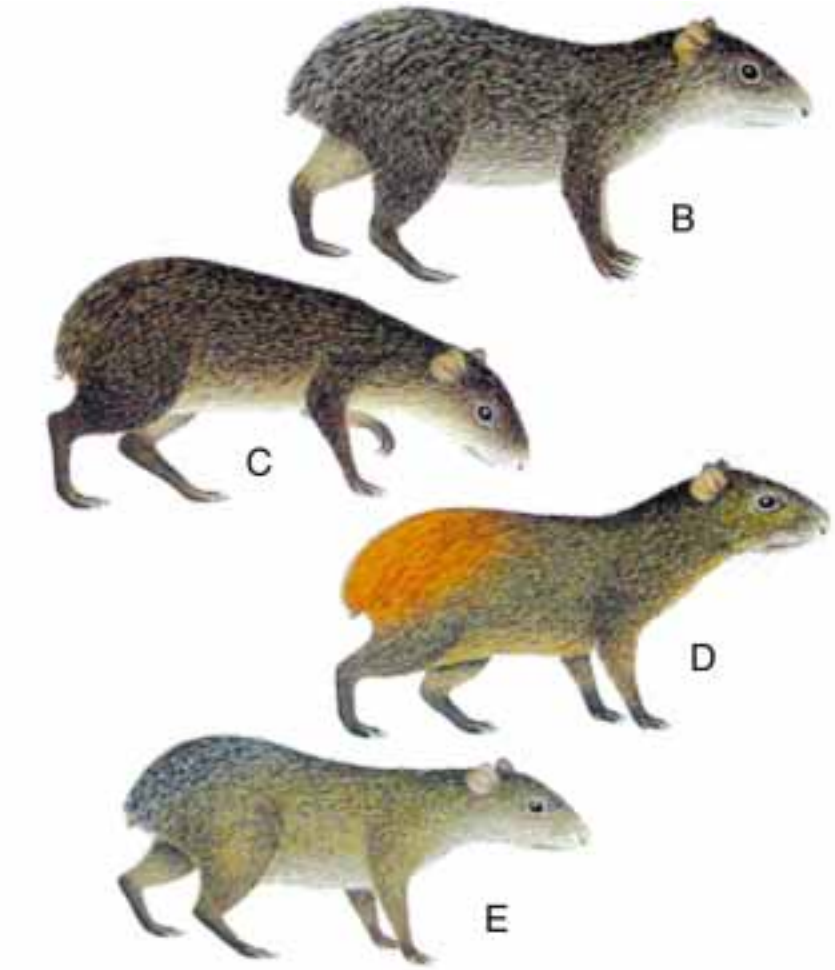
Picture 8: ***Dasyprocta leporina*** [Dark Brown body with Black Rump from Gary Garcia OTF-APL, UWI, Trinidad, Trinidad and Tobago]

Picture 9: ***Dasyprocta fulginosa***
[Source: www.junglephotos.com]

Picture 10: ***Dasyprocta azarae***
[Source: www.arthurgrosset.com]

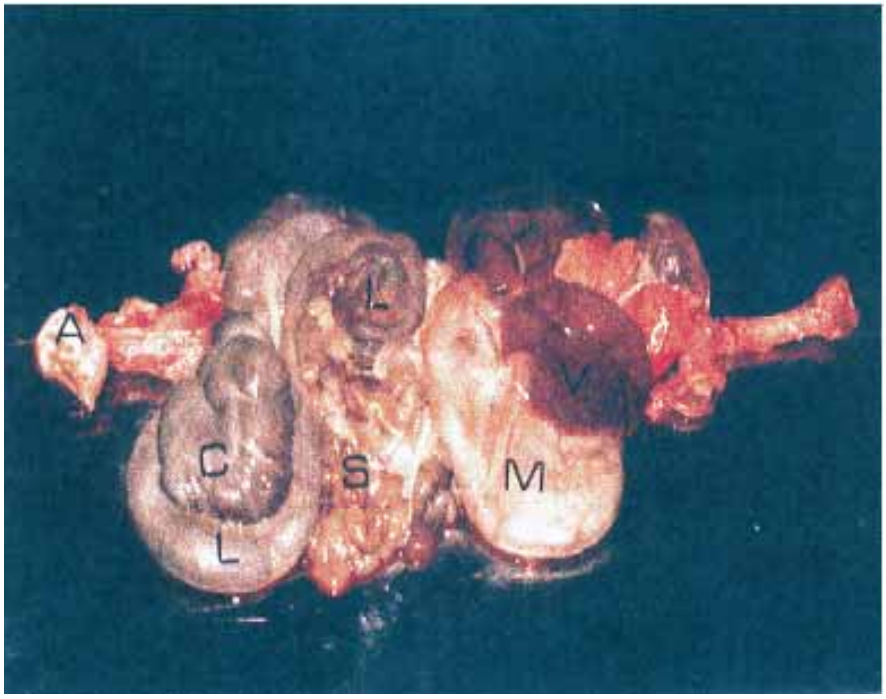
Picture 11:
Color Plates of *Dasyprocta* species
[Source: Emmons and Feer (1990,1997)

5: Brown Agouti [*D. variegata*]
6: Black-rumped Agouti [*D. prymnolopha*]
7: Mexican Black Agouti [*D. mexicana*]
8a: Central American Agouti , uniform reddish brown [*D. punctata*]
8b: Central American Agouti, blackish with mid body yellowish, and rump with long black, white tipped hairs [*D. punctata*]
9: Azara's Agouti [*D. azarae*]
10: Black Agouti [*D. fuliginosa*]
11: Red-rumped Agouti [*D. leporina*]

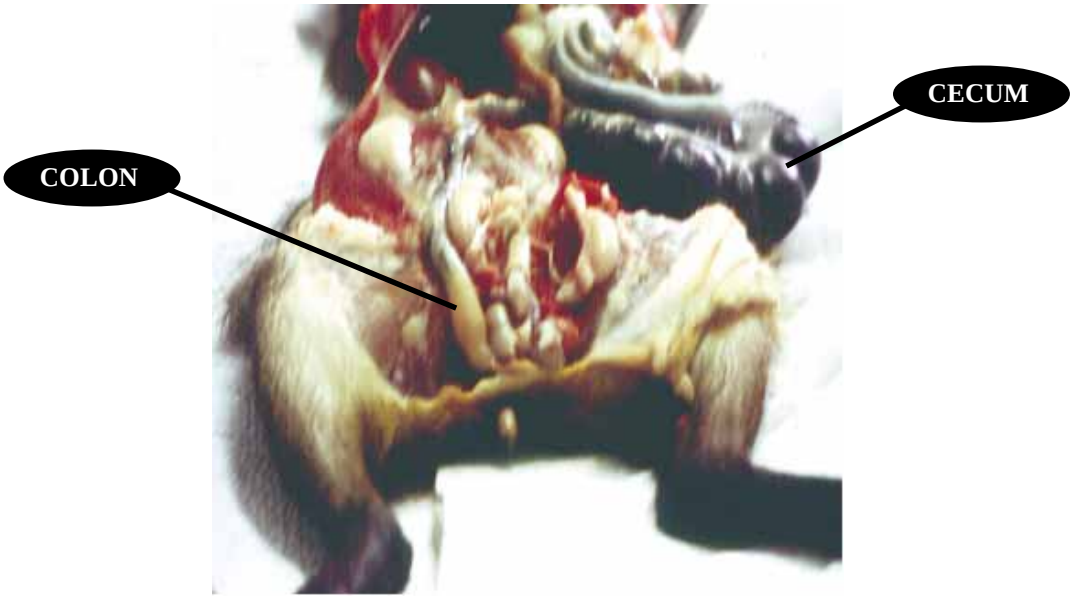


Picture 12:
Color Plates of Agouti
[Source: Linares (1998))

B: Picure negrozco – *D. fuliginosa*
C: Picure deltano – *D. guamara*
D. Picure comun – *D. leporina*
E. Picure zuliano – *D. punctata*



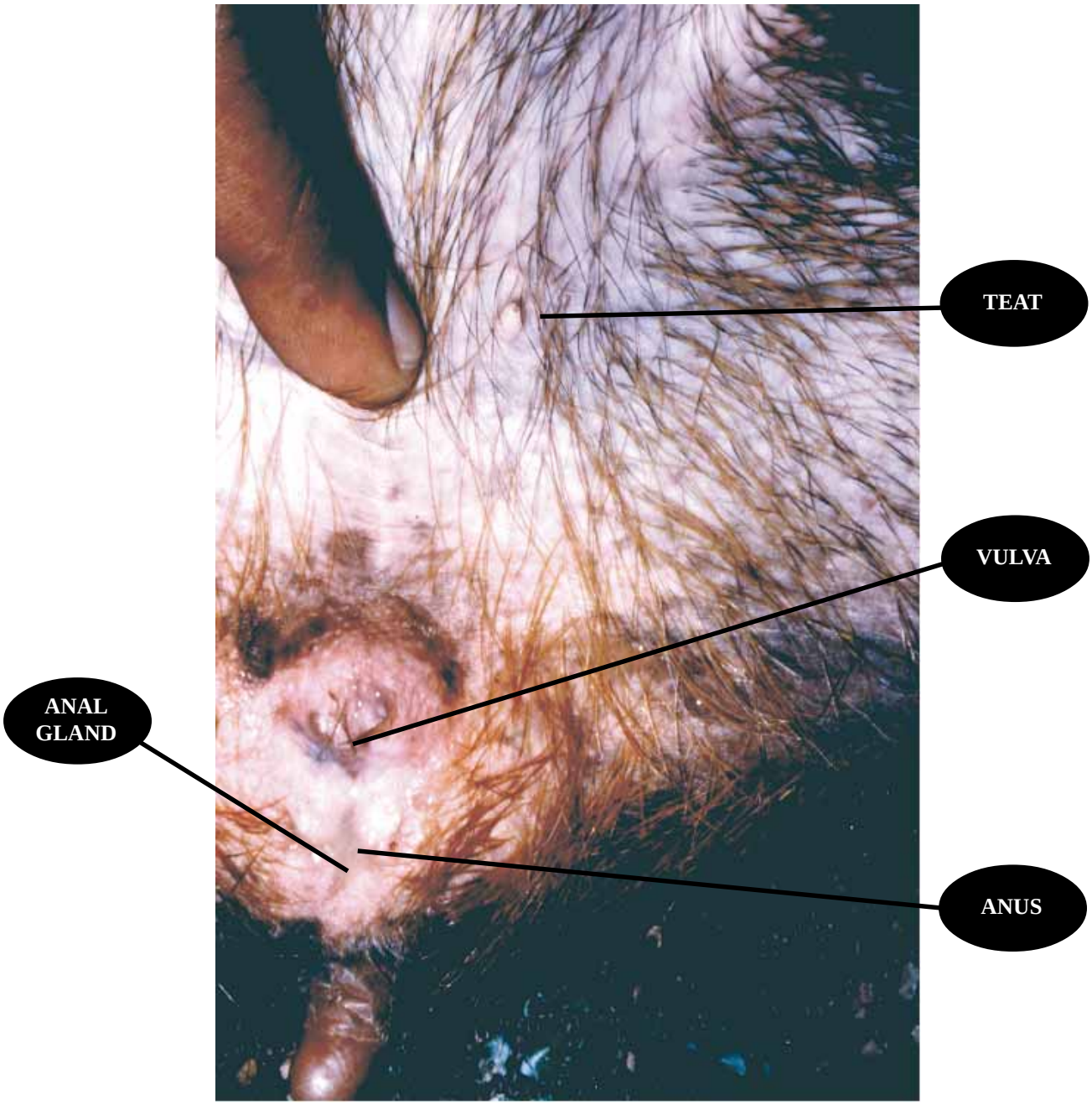
Picture 13: The Digestive System of the Agouti (*Dasyprocta leporina*)
A- Anal Gland: C-Cecum: L-Large Intestine: S-Small Intestine M-Stomach



Picture 14: The Exposed Digestive System of the Agouti (*Dasyprocta leporina*) showing the large cecum on the right.

Picture 15(a): The Male Agouti (*Dasyprocta leporina*) Reproductive Parts

Picture 15(b): The Male Agouti (*Dasyprocta leporina*) Reproductive Parts



Picture 16a: The Vulva, Anal Glands, Very Short Tail and Undeveloped Mammary Glands of a Female Agouti (Agujen)

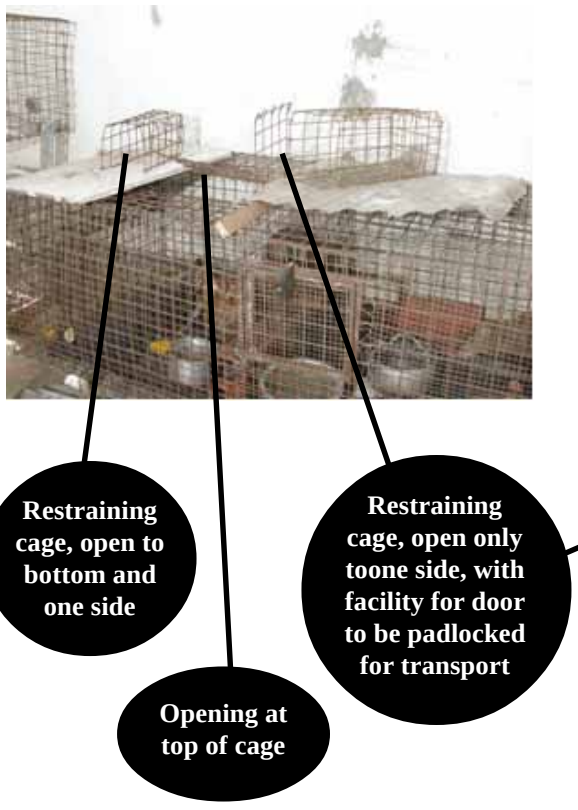
Picture 16b: The mammary Glands of a lactating Female Agouti.

Picture 17: A Method of restraining a young Agouti (*Dasyprocta leporina*)

Picture 18: A Method of restraining a semi wild adult Agouti (*Dasyprocta leporina*)

Picture 19: Inserting the restraining cage at the top of the breeding cage

Picture 20: Restraining the adult Agouti within the breeding cage



Picture 21: Restraining Cages

Picture 22: Dr Gary Garcia and an adult female Agouti in a simple portable restraining cage with a padlock.

Picture 23: Experimental Agouti (*Dasyprocta leporina*) Housing

GLOSSARY OF TERMS

Agouti
This refers to
Dasyprocta leporina / *Dasyprocta aguti.*

Agujen
an adult female agouti

Agujoe
an adult male agouti

Aguyoungjen
a young female agouti

Aguyoungjoe
a young male agouti

Agusuckling
a young suckling agouti

Anus
This is a horizontal cleft bordered by two large labia, which facilitates the removal of waste from the intestines at the end of the large intestine.

Cecum and Colon
These sac-like structures hold ingesta to facilitate the removal of water and electrolytes (minerals). The cecum of ruminants is not very well developed and plays a rather insignificant role in digestion. The cecum in herbivours [sheep, goats, cattle, horses] and rodents function as digestors of fibrous materials such as forages. Avians have two blind sacs (ceca) where a limited amount of bacterial activity and subsequent absorption has been observed.

Days between Union to Conception
The number of days from the time a female or a group of females are exposed to a male and the estimated time conception occours [the number of days from union to parturition minus 104 days].

Forages/ Roughages
These are derived from the green plant material produced by photosynthesis. They contain fibre that is eaten and digested by ruminants. Wilted plant materials such as hays would not therefore be green.

Gestation length
Length of pregnancy.

Lactation period
The length of time the female is able to produce milk.

Large Intestines
In addition to being a passage-way for waste materials, it absorbs water from the mass that comes form the small intestines. It consists of the colon and cecum.

Length of the oestrous cycle
The number of days between successive esturs/ oestrus/ heat periods, [period of receptivity of the male by the female].

Litter interval/ Parturition interval
The number of days between two parturtions

Liver
The liver comprises of two lobes, and incorporates the gallbladder. Its primary role in digestion and absorption is the production of bile. Bile facilitates the solubilization and absorption of dietary fats, and also aids in the excretion of certain waste products.

Ovulation
The time of the production of the fertile female cells for reproduction.

Parturition
The actual process of giving birth.

Postpartum Oestrus
Estrus displayed shortly after parturition or the bringing forth of the young by the female.

Puberty
The period when the animals reproductive organs begin to function.

Rectum
This is a short passage, which empties into the anus.

Rodent
Those animals with very long and continuously growing incisors.

Sexual Maturity
The time in the animals life when they are able to successful reproduce.

Small Intestines
The walls of the small intestines are lined with many projections called villi. It is through these villi that nutrients are absorbed into the blood and lymph stream, and carried to the various cells throughout the body. The main function of the small intestines is to absorb food nutrients. While digestion is taking place, the muscular walls contribute to the process by rhythmically contracting to mix the food with the digestive juices. This brings the nutrients in contact with the villi for more complete absorption to occur, and pushes the mass along the tract. The small intestines comprise of the duodenum, ileum and jejenum.

Stomach
This organ is responsible for churning and mixing ingesta with acidic gastric juices and digestive enzymes.

Weaning
The event when the suckling young are removed from the female and no longer are able to get mothers milk.

Weaning age
The age at which weaning takes place.

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