GIANT OTTER FINAL REPORT

Nicole Duplaix, PhD

WWF-Guianas Rapid River Bio-assessments and Giant Otter Conservation Project

FG-40 FY2002

Executive Summary

Like the Amazon River in Brazil, the rivers and wetlands in the Guianas hold the greatest concentration of freshwater biodiversity in the world. However, freshwater species and their freshwater biomes in the Neotropics are, on average, much more threatened than their terrestrial counterparts (Olson *et al*., 2001). Governments in the Guianas (Suriname, Guyana and French Guiana) face increased pressure to exploit their natural resources for short-term benefits. Inappropriate resource use, such as unregulated gold mining with its mercury pollution, is becoming a serious threat to long-term conservation in all three countries.

The essence of this project was to foster the protection of key freshwater ecosystems in Suriname and Guyana. We conducted five rapid bio-assessment of key rivers (some of these several times), training national
and promote watershed protection and management. Further, Giant Otters require large home ranges and can rapidly disappear from even remote river systems due to their pronounced sensitivity to human disturbance and vulnerability to mercury accumulation. As such they are excellent "bio-indicators" too.

This project aimed to help the people of the Guianas better understand, protect and profit from their freshwater resources. The project coordinator trained local biologists, university students, indigenous communities and NGOs at the national and regional level. By training a few who, once motivated, can then train others, we hope that this conservation effort will have long-term effects.

During this project we surveyed three rivers in Suriname, some several times, (Kaburi Creek, Upper Coppename River, Cusewijne River) and three rivers in Guyana (Upper Rupununi River from Rewa to Karanambo, Bat Creek and a portion of the Lower Rewa River.) Giant otters were sighted on every river surveyed for a total of 31 hours 43 minutes of observation time. On some rivers (Cusewijne River, Bat Creek) the otters were very shy, on others they were less so (Upper Coppename, Kaburi) and around the Karanambo Ranch, Guyana, they were habituated and could be observed for hours on end.

The rivers had varying levels of human use and human impact:

- ***Kaburi Creek, Suriname***: This area was proposed as a Nature Reserve in 1978 for its high biodiversity and its resident Giant otter population, but this has never been ratified by the government. The local Carib Indians in Washabo consider this creek their 'holy place' and have been protecting it for decades. The lower reaches of the creek were logged in the 1990s and now the upper reaches, 12 km upstream, are being logged. Hunting, fishing and human camping activities have also markedly increased over the last three years. The Giant otters have become very shy as a result.
- ***Upper Coppename River, Suriname***: Now part of the Central Suriname Nature Reserve, the upper reaches of the Coppename River above Raleigh Falls remain

pristine and virtually undisturbed. The biodiversity is exceptionally high with many rare species represented. There is no adverse human activity except for occasional fishing and hunting expeditions by local people. As a result many large vertebrates are quite common: Giant otters, jaguar, puma, tapir, peccaries, Dwarf caiman, harpy eagle and capybara.

- ***Upper Cusewijne River, Suriname***: Part of the Upper Cusewijne Nature Reserve since 1976. Once a protected creek with a large population of Spectacled caiman and Giant otters, the Reserve has now become a favorite destination of hunters and fishermen from nearby towns. Every weekend, in the dry season, the creek is used by campers who have little respect for the wildlife or the park regulations. As a result the Giant otters have fled up the small forest creeks or been shot. We observed evidence of poaching fish with nets and the shooting of protected birds. There appears to be little or no enforcement of park regulations on the creek.

- ***Upper Rupununi River, Guyana:*** Located near the Karanambo Ranch in southwestern Guyana, the Giant otter groups along the river have been actively protected and habituated by the McTurk family for fifty years. However, hunting and commercial fishing activities are increasing due to the influx of Brazilians in Lethem. Several habituated otters were killed by local fishermen.

- ***Bat Creek, Guyana:*** Located on the Rupununi River near Rewa, this long forest creek opens up into several ponds where they are at least four groups of resident otters. The people from Rewa hunt and fish in the creek but there appeared to be little visible impact.

- ***Lower Rewa River, Guyana***: a brief survey was made of the lower reaches of the Rewa River near the village of Rewa. There are isolated oxbow lakes in the rainforests along the bank, a unique feature of rivers in Guyana not found in Suriname. There are resident populations of Giant otters and we received reports that far up the Kitaro River, a tributary further upstream, the area is undisturbed and pristine. The people of Rewa hunt, fish and have kitchen gardens along the Lower Rewa but there seems to be little adverse impact.

These six rapid river bio-assessments surveys helped to better understand Giant otter population distribution, to recognize the species' habitat requirements, and to document the increasing level of anthropogenic threats that seem to be rapidly accelerating on certain rivers. As such these findings will contribute to a more effective Giant otter conservation program over the next decade but our work has hardly begun.

This project started in March 2002 with a grant allocation of World Wildlife Fund-US and was expected to last through October 2003. However, due to lack of funding the project was terminated in November 2002 and, therefore, all of its objectives were not met.

Dr Nicole Duplaix, the Project Coordinator, was uniquely qualified to undertake this project with over 27 year's experience in international conservation program creation and management, and with extensive field experience in the Guianas. She is the founder of the IUCN-SSC Otter Specialist Group and of the TRAFFIC wildlife trade-monitoring network.

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A. Background

The Region. The Guayana Shield Region of South America ranks as one of the world's last great wild places. Occupying roughly the northeastern third of Amazonia, it is particularly noteworthy for its high species endemism, unique ecosystems, and exceptionally pristine state, as well as for its cultural diversity. Suriname and Guyana have a human population of less than 1.2 million people – the lowest population density of any tropical rain forest region. Not surprisingly, they also have the highest percentage of intact tropical rain forest, with 80-90% still in pristine condition.

Along with the Amazon River in Brazil, the rivers and wetlands in the Guianas hold the greatest concentration of freshwater biodiversity in the world. Sixty-five percent of the largest freshwater mammal species are in the Neotropics and most are represented in the Guianas. With over 790 species of fish and a rich fauna of large aquatic vertebrates, such as endangered Giant Otters, manatees, *Arapaima*, caiman and anacondas, the Guianas are a truly exceptional region.

Threats. However, freshwater species and their freshwater biomes in the Neotropics are, on average, much more threatened than their terrestrial counterparts (Olson *et al.*, 2001). While the sustainable use of economically important natural resources and the protection of endangered species are objectives of the national conservation strategies of Guyana, French Guiana and Suriname, all three now face increased pressure to exploit their natural resources for short-term benefits. Inappropriate resource use is becoming a serious threat to long-term conservation. Hydroelectric dams, mining pollution, deforestation, hunting, over-fishing and heavy use of motorized boats take their toll on the fragile watersheds of the region.

Today the watersheds of the Guianas another severe threat: the explosion of industrial and small-scale gold mining activities. Largely unmonitored, they result in significant environmental and public health hazards due to chemical and environmental degradation. Large concentrations of sediments are deposited in the rivers, high levels of mercury evaporate and seep into the watershed, multiple pools of polluted water dot the land, and large areas are denuded. These types of damage have been recorded at the top of most of the watersheds in the region presenting severe long-term threats to the water quality of the rivers and creeks

downstream and to all who depend on them. In the Comewijne River in Suriname, for instance, fish populations have been affected by the increase in turbidity, and the mercury levels that have skyrocketed to ten times the norm – as evidenced by the levels of mercury found in *Hoplias* – a favorite fish of both people and Giant Otters (Qwik & Ouboter, 2000)

Bio-indicator species. The endangered Giant Otter (*Pteronura brasiliensis*) is the largest of the world's 13 otter species. Extirpated from much of its former range in South America, the Guiana ecoregion remains its largest stronghold. The IUCN Otter Specialist Group has identified the Guianas as a priority Ecoregion to conserve Giant Otters due to their concentration in relatively intact populations and the remoteness of the tropical forests and rivers in the region. In 2002, the Conservation International's Priority Setting Conservation Workshop for the Guianas also identified the Giant Otter as a critically endangered flagship species requiring long-term conservation efforts.

The Giant Otter is a top predator of the freshwater food chain and as such is a useful "indicator species." It requires large home ranges and can rapidly disappear from even remote river systems due to their pronounced sensitivity to human disturbance and vulnerability to mercury accumulation – their presence or absence on a given river is an indicator of the overall health of that river's ecosystem. Finally, the charismatic and endangered Giant otter is popular in the region, and has not been hunted to near extinction as in other parts of South America. As such, it can be used as a catalyst to spearhead conservation awareness and to promote actions to protect key rivers.

Forest Cover and Protected Area Statistics for Suriname and Guyana

Source: IUCN-UNEP, WCMC, Cambridge, UK

SURINAM STATISTICS

Land area: 156,000 km²	Area of forest: 133,201.5 km²							% Land area forested: 85.4		
Forest Type	Area Protected (km²) in IUCN Categories I-VI:							Total Forest (km²)	Total Protected (km²)	% Protected
	Ia	Ib	II	III	IV	V	VI			
Tropical										
14 Lowland evergreen broadleaf rain forest			170.5		3916.9			110431.0	4087.4	3.7
15 Lower montane forest			5.0		335.7			5112.5	340.7	6.7
16 Upper montane forest								2.0	0.0	0.0
17 Freshwater swamp forest					747.5			13084.3	747.5	5.7
18 Semi-evergreen moist broadleaf forest								11.3	0.0	0.0
21 Mangrove					229.7		168.6	1071.8	398.3	37.2
22 Disturbed natural forest								12.3	0.0	0.0
24 Sclerophyllous dry forest					43.8			3461.3	43.8	1.3
26 Sparse trees and parkland					3.1			15.3	3.1	20.4
Total	0.0	0.0	175.5	0.0	5276.6	0.0	168.6	133201.5	5620.8	4.2

GUYANA STATISTICS

B. Description of the Project

Background: The Guianas remain the last stronghold of pristine Giant otter habitat and good population levels. The survival of the Giant Otter populations in the Guianas is essential to survival of this endangered species in South America. Our river surveys will help to better understand Giant Otter population distribution, behavior and demography and the health of this important population. This will contribute to a more effective protection of the population in the region.

Data from the first field studies of Giant Otters conducted in 1976-1978 (Duplaix, 1980) will form a useful comparison base for present-day findings along the same rivers and others to determine whether human activities have changed and whether Giant Otter population levels are stable or declining. While the mercury pollution related to the widespread artisanal gold mining activities is a major health concern in the region, this project will not directly investigate this issue – other WWF-Guianas projects are doing this. Our project records the types and level of human use, including gold mining, along the rivers surveyed and their impact on the biodiversity.

The indigenous populations of the interior, usually Amerindian tribes, need sound income generating activities that do not tax their resources. Recently, many villages have started commercial fishing with nets, shipping bush meat to the capital, and catching wildlife for the pet trade to make money. Better alternatives need to be developed to reduce loss of natural resources.

Suriname and Guyana have developed Conservation and Biodiversity Action Plans but lack the financial and human resources to conduct the necessary biodiversity assessment surveys to implement them. Our project will provide biodiversity baseline data to these agencies.

Aims: This project seeks to actively bring together, motivate and train biologists, students,

Goals:

- To maintain and protect the freshwater biomes of the Guianas and their bio-indicator species, particularly Giant Otters.
- Conduct rapid biodiversity assessments of key river systems, training nationals in river monitoring and biological survey techniques, and assisting indigenous river communities in identifying and developing environmentally sound income-generating activities.
- The results of the monitoring efforts will contribute to a better understanding and appreciation of the freshwater resources of the Guianas, thereby helping maintain the unique biodiversity of the rivers and ensuring the long-term survival of their endangered Giant Otter populations.

Objective: Establish a network of trained personnel in the Guianas to monitor the biodiversity of key rivers, using bio-indicator species such as the Giant Otter, and foster increased interest and commitment of the nationals and the indigenous people for effective protection of the freshwater ecosystems.

C. The Giant Otters – an introduction

The species. The Giant otter *Pteronura brasiliensis*, one of the larger carnivores of South America, is a primarily terrestrial mustelid that has become extremely well adapted to using an aquatic environment. Adult males measure up to 1.8 m and weigh 26-32 kg. , females measure up to 1.7 m and weigh 22-26 kg. This species lives in large, noisy family groups and shows little fear of humans (Duplaix, 1980). The photographs in this section will also serve as a general introduction to the species.

The ecology and behavioral repertoire of *Pteronura* have been described in detail in several major publications and will not be reviewed here (Duplaix, 1980 and 1982, Groenendijk, 1995, Carter & Rosas, 1992, Schweizer, 1992, Schenck, C. and Staib, E. 1998, *et al.,* see references). We will discuss our new observation and findings later in this report.

Its status. Such a large, diurnal and gregarious animal makes an easy target for pelt hunters. Today it is the combined effects of habitat loss and the demands of the fur industry up to the mid-1970s that are responsible for *Pteronura*'s endangered status over much of its range in South America. In Suriname, where the local populations have never hunted it, the Giant otter enjoys relative security, particularly in the more remote rivers of the interior. For this reason, the first detailed study of *Pteronura* in the wild was made in Suriname in 1976-1978, much of it on Kaburi Creek, a tributay of the Corentyne River (Duplaix, 1980).

Habitat selection and seasonal requirements. Like many carnivores, Giant otters select habitat according to prey abundance/availability/vulnerability criteria that may fluctuate seasonally (Duplaix, 1980, 1982). In Suriname *Pteronura* prefer slow-flowing clear black water creeks and rivers, particularly during the dry season when they prey heavily on fish that rest on the bottom in shallow water like *Hoplias* (pataka*)* and catfish (kwikwi and jacky). The availability of preferred prey species in shallow water is the governing factor in *Pteronura*'s seasonal movements. Low sloping banks with good cover and close access to prime fishing areas are preferred by otters for their campsites where they rear their cubs. All these conditions are met in Suriname both in Kaburi Creek and on the Upper Coppename River from mid-September to April during the dry season making them both ideal Giant otter habitast (Duplaix, 1980, Duplaix *et al.,* 2001). In Guyana, on the Rupununi River, the banks are much higher, >5m in some areas, there are fewer campsites and more dens, but fishing areas are equally good.

Group structure and behavior. *Pteronura* are seen in groups ranging in size from two (a pair) to an extended family group of 7 or 8. Larger groups of 14 or more otters have been seen but these were probably two family groups traveling together from their dry season area to their rainy season area. Solitary animals, usually subadults, are 'transients' passing through the area that seldom remain for long (Duplaix, 1980).

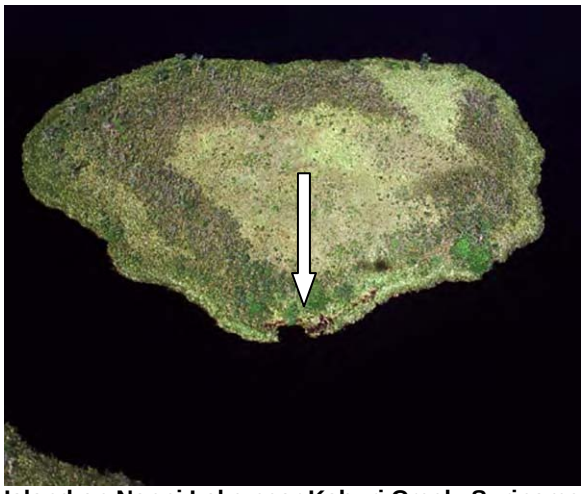
Each group clears a "campsite" along the bank and marks it with feces and urine, mixed with mud. The best sites, often perennial, are in key areas near fishing "ponds" or shortcuts avoiding a loop in the creek. These larger sites may have a den in the bank, and some even

have backdoor exits into the forest or swamp away from the creek. Such sites are often located on the only areas of high ground available, particularly in small creeks in swamp forest such as Kaburi Creek, Suriname. In the upper portion of Kaburi Creek, 7-15 km from the mouth where high ground is at a premium. One group may use and mark several campsites in its territory and use several dens to rear its cubs.

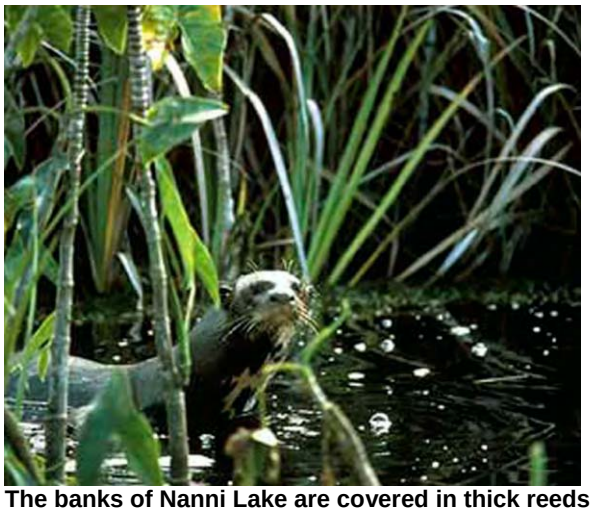
Seasonal population dynamics. The family groups of resident otters along a creek or river, each occupy a territory at the height of the dry season. At this time they are usually raising their cubs, and they actively defend their territory using their campsites as scent marking stations. Each group clears "campsites" along the bank and marks them with feces and urine, usually trampled into the muddy substrate. The best sites, often perennial, are located in key areas: near fishing "ponds", on bends of the creek, near smaller creek entrances, or at "shortcut" paths avoiding a loop in the creek. These larger sites may have a den or dens dug in the bank, and some even have backdoor exits into the forest or swamp away from the creek. Such sites are often located on high ground except in swamps. One group may use and mark several campsites in its territory and use several dens to rest and rear its cubs.

Giant otters can be identified individually using the variation in white spots and blotches on their necks (see photos). If the otters allow the observer to follow them, after a few days' observation it is possible to recognize some of the individuals in a group. Easy individual recognition is a great asset in determining territory boundaries and group movements up and down a creek.

Suriname: Two different Giant otter habitats, Giant Otter Introduction #1



Island on Nanni Lake near Kaburi Creek, Suriname. An otter campsite is visible as a thin brown line along the bank (arrow). This campsite has been used for many years.



The banks of Nanni Lake are covered in thick reeds and vegetation, making the access difficult for otters to clear campsites.

Close-up of island on Nanni Lake (see above). The otter campsite is at water level. Otters do not dig dens in this marsh-type habitat and may sleep in the reeds, instead.

Mother Falls, Upper Coppename River, Suriname on a granite plateau with many islands and sandbars. Otter mark individual boulders and islands during the dry season and have few large campsites.

Sloping, sandy areas on small islands during the dry season are used by both Giant and Neotropical otters to leave scats. Tonken Falls, Upper Coppename R.

These marking areas are often located near rapids and several such sites may span the width of the river. Langa Falls, Upper Coppename River.

Fresh Giant otter campsite (Upper Coppename R., Suriname) Giant Otter Introduction #2

Campsite on an island midstream. The sandy area cleared by the otters is visible. Upper Coppename River, Suriname

Urine and scent marking (left) show fresh scratch marks. Vegetation has been trampled (right).

Freshly trampled vegetation is pulled out and rolled under the forepaws or body.

Single scats that have been rolled in the sand but not trampled into it.

Scent mark, a small excretion from the scent gland without faeces. It has a strong, musky smell.

Right hind paw print. Note thin digits with no claw marks visible.

Giant otter dens (Suriname and Guyana) Giant Otter Introduction #3

Typical den entrance near water's edge with or without a campsite above it. Tracks are visible leading into the den. Kaburi Creek, Suriname

Dens are remarkably similar in size and shape. They start as a single chamber, expanding sometimes to 2 chambers. May be used for years or until bank collapses. (Duplaix, 1980)

A large shallow den or 'resting den' does not have deep chamber(s). It may be used by transient otters and also Neotropical otters. No campsite or latrine. Upper Coppename River, Suriname

Large den at the top of a nearly vertical bank (see below) used by a group of 6-8 otters for several years. There is no campsite above it but a small latrine at the base (green area). Karanambo, Guyana.

Adult male at den entrance at top of sloping bank, Karanambo, Guyana.. Note lack of vegetation as compared to dens on Kaburi Creek.

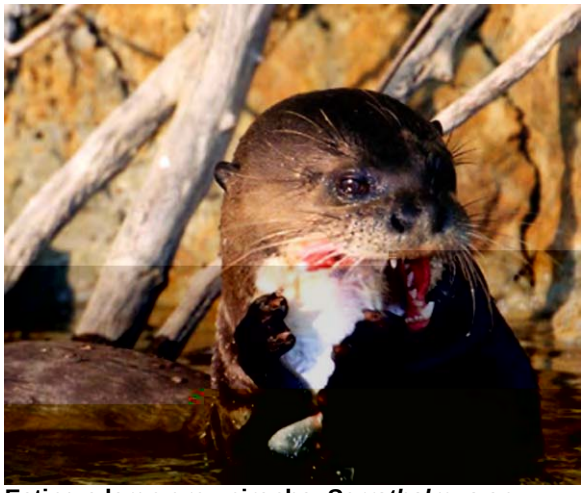
Four otters coming out of den above (2 subadults in water, cub on bank). Adult otter (arrow) is marking the latrine and trampling scat. Karanambo. Guyana

Giant otter feeding behavior (Suriname and Guyana) Giant Otter Introduction #4

Giant otter fishing in shallow water during dry season. Karanambo, Guyana.

Larger fish are caught and brought to a shallow spot near the bank. Kaburi Creek, Suriname

Fish are eaten head first, except for large catfish where the bony head is discarded first. Tiger catfish *Pseudoplatystoma fasciatum*. Karanambo, Guyana.



Eating a large grey piranha, *Serrathalmus* sp. Karanambo, Guyana.

Eating a warapa *Hoplorythrinus unitaeniatus*, a preferred prey. Kaburi Creek, Suriname.

Eating plated catfish kwikwi, *Hoposternum thoracatum*, a common prey in small creeks. Kaburi Creek, Suriname.

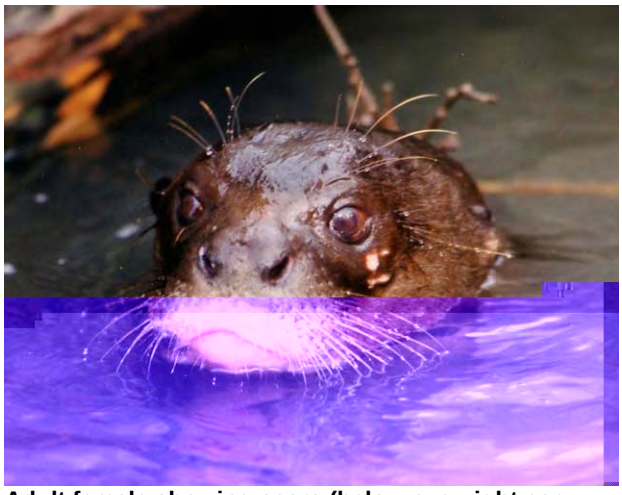
Giant otters are semi-aquatic and diurnal, living on rivers, creeks and lakes. They are curious, often approaching boats, and are vulnerable to poachers.

Otters investigate while swimming with a 'periscope' head-up posture. Cubs are unable to raise their necks out of the water until they become strong swimmers.

Family group in oxbow lake, two adults in front followed closely by 3 cubs. Karanambo, Guyana

A family group of 7 otters (adult pair, subadults and cubs) on Kaburi Creek, Suriname.

A subadult may leave the family group after 2 years before the next litter is born or be pushed out by the adults with a fight. They become 'transient'(s) until they find a mate, set up a territory or, rarely, join another group in the area.

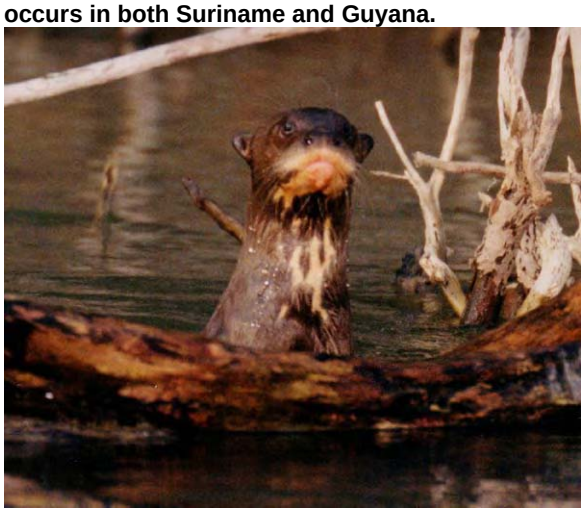


Adult female showing scars (below eye, right ear missing) from fights with subadults as they are ousted from the group. Hostile encounters between neighbouring groups occur rarely, the otters avoiding contact instead.

Giant otter cubs (Suriname and Guyana) Giant Otter Introduction #6

These small cubs were removed from their den to keep as pets, later confiscated by wildlife officers. Such young cubs have little chance of survival. This occurs in both Suriname and Guyana.

Female otter exiting den, followed by male 4-month old cub. Karanambo, Guyana.

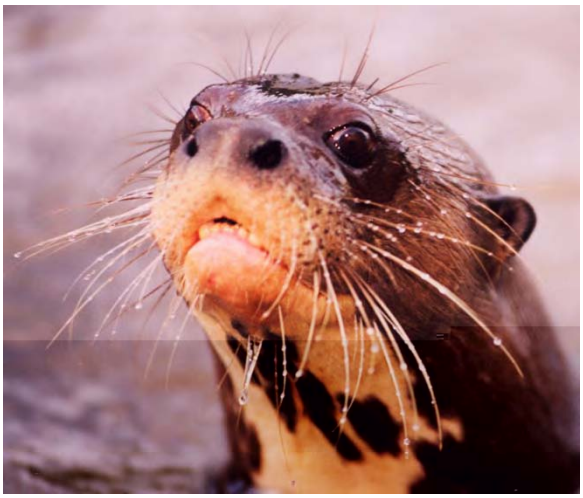


4-month old cub showing its distinct throat pattern. Its white patches are still cream-colored, and will turn white later. Karanambo, Guyana.

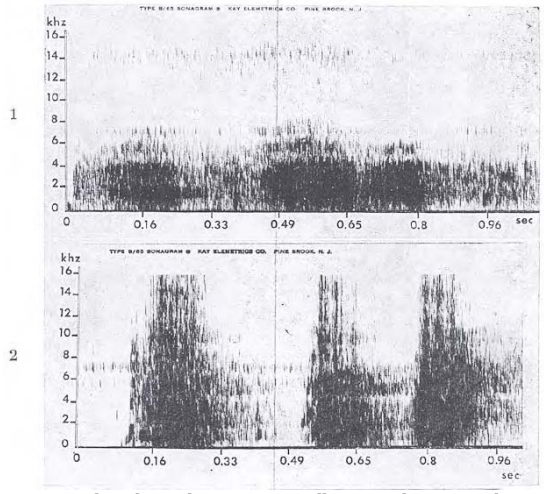
Family group, cub at far left next to mother. Adult male in water with mouth open, three subadults cluster around him. Karanambo, Guyana.

Cubs stay close to adults during feeding and often give food 'begging call' (see Vocalizations). Karanambo, Guyana.

Cubs eat fish shared with them by adults or subadults, even when still suckling. Small pieces are eaten while lying on the back. Karanambo, Guyana.

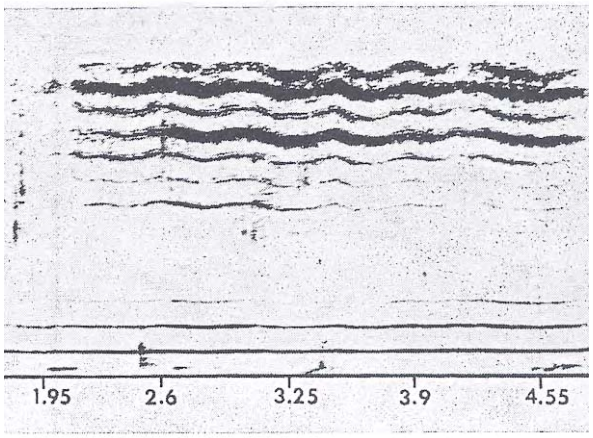


A startled otter will emit a sharp ‘HAH !’, a discrete sound given with the mouth partly open. Indicates a low level of alarm or interest.



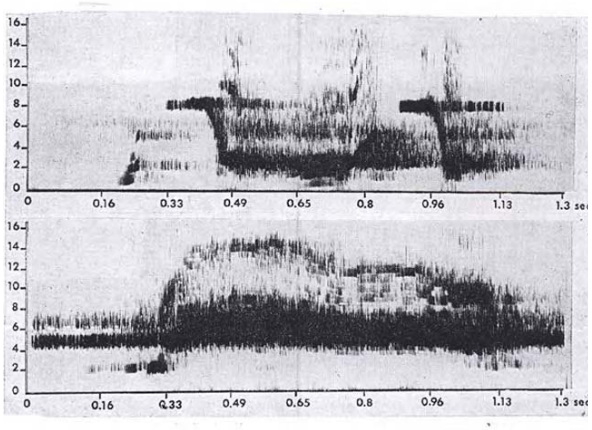
3 HAH! (top) and 3 ‘snorts’ (bottom), a much louder, explosive, sound indicating alarm.

When alarmed, otters may lie very still and silent in the water, usually hidden under vegetation.



A long ‘hum-growl’ is a low intensity threat given by adult otters. It may turn into a much louder wavering scream and attack.

A cub (right) gives a ‘food begging call’ ignored by the adult (left). Subadults will give such calls too and steal fish from each other.



3 ‘food begging calls’ (top) and a longer, modulated one (bottom).

D. Methods

Background

The methods used to conduct these surveys were devised by the researcher in her original river surveys in Suriname in 1976-1978 (Duplaix, 1981). Since then, the use of the Global Positioning System (GPS) has made mapping more accurate and video cameras have made individual Gant otter identification more rapid.

Materials

A 10m-long wood dugout canoe with a 25HP outboard (Upper Coppename River), a Zodiac inflatable with a 25HP or 45HP engine (Suriname), or a 8m-long aluminum boat with a 15HP outboard (Guyana) were used, depending on the type of river, to conduct each survey. When otter signs are found, the researchers switch to an aluminum canoe and paddle slowly up and down the creek or river to search for further otter sign along the banks. The longest portion possible of each river or creek is surveyed from the source (or a portion of the river legth when time or fuel supplies are limited).

Data Acquisition

Using the canoe, each Giant Otter site and/or den, along both riverbanks and in nearby creeks, is pinpointed by GPS and measured. Numbered metal tags and plastic flagging are left in place to identify each site and then site details are measured, sketched and recorded on data sheets (see below). If the area is revisited the original site numbers are used or when new sites are found others added.

The same data tracking sheets are used to record details on the otters, river (size, depth, color, turbidity, flow and level), bank vegetation type, and climactic condition so that the data obtained from different rivers can then be compared and quantified.

Sightings

Whenever a Giant Otter or group is sighted its location, group size, and behavior are noted on printed data sheets (see below).

The following data are recorded on these data sheets when a Giant otter is seen or and when an otter campsite is visited,:

- Date, time (start and end), river system, GPS location, vegetation type, water flow and depth, water color and turbidity, bottom type,
- Number of otters seen, presence/absence of cubs, presence/absence of dens, measurements of campsite and den(s), height of den above water, presence/absence of markings/latrines/claw marks and whether fresh or old, location, direction and activity of the otter(s) (in water, on land, swimming, resting), behavior of the otter(s) (approach, avoidance, alarm, indifference), vocalizations heard if any. Observation cut off by otter/observer.

As Giant otters are strictly diurnal all our observations are made during daylight hours, usually using 10x40 binoculars. When possible, individual otter neck patterns are sketched, using a video or still camera, so that individual otters can be identified should they be seen

again. The researcher attempts to follow the otters at a distance for as long as possible unless the otters show alarm – if so, the observation is stopped. No attempt is made to call to the otters or attract them.

At Karanambo Ranch, Guyana, a group of habituated Giant otters are fed once or twice a day by the staff to get them to come close for tourists visiting the river. We never fed otters and kept interaction to a minimum on all other rivers.

Fauna lists

Biodiversity assessments were made on each river visited, using the river as a transect line, we recorded and identified all mammal and bird species seen

All riparian vertebrate fauna seen or heard during the day or night were identified (when possible) and noted. A detailed list of the mammals and birds seen is made on each river survey (see lists under river surveys). GPS locality data is noted for endangered species or species of special interest.

Tissue sampling

Six tissue samples of *Hoplias* fish are taken per survey and preserved for lab analysis to determine mercury levels. This species, favored by people and otters, is a well-known reservoir of mercury contaminants. However, due to lack of funds the samples were not analyzed.

Human use and threats

A detailed report is made and photographs taken of any unusual circumstance or event including human activities: deforestation, gold mining, commercial net fishing, natural fish kills, heavy motor boat use, presence of hunters not belonging to local communities, wildlife collectors and/or tourists.

The data obtained in this manner provide an assessment of both the presence/absence of Giant Otters and the level of human use in a form that can be readily quantified and compared.

Giant otter individual neck patterns (Suriname and Guyana) – Methods #1

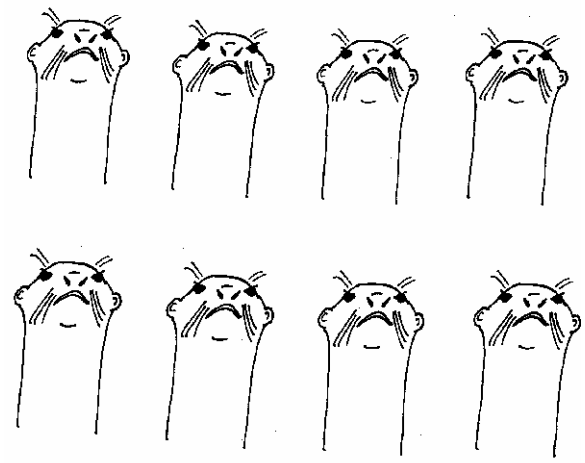
Each Giant otter has a unique throat pattern of spots and white areas, making individuals easy toi

duals is hard to determine unless the otter goes ashore. Adult males (picture at left) may have larger necks than females (above). Karanambo, Guyana

Some otters also have more white on their muzzle than others. Karanambo, Guyana

Subadult, Karanambo, Guyana

Part of a group in an oxbow lake in Karanambo, Guyana.



When a new otter is sighted, a sketch of its throat pattern is quickly made on a printed sheet.

GIANT OTTER SURVEY CHECK SHEET

[Prepared by Dr Nicole Duplaix, E-mail: NDParis@aol.com]

TIME (24 hrs) START:..... END:..... OBSERVER:.....

DATE:..... REGION:..... RIVER:..... WATERSHED:.....

GPS:..... FLAG INFO:..... TAG #:.....

VEG. TYPE:..... WATER FLOW:..... DEPTH: .....m +/-

WATER COLOR/TURBIDITY: ..... BOTTOM TYPE:.....

TOTAL NUMBER OTTERS SEEN:..... (..... CUB(s))

CAMPSITE PRESENT: yes..... no.....

LENGTH:.....m WIDTH:.....m HEIGHT above water line: .....m

DEN(s): ..... CHAMBER(s): ..... WIDTH:.....cm HEIGHT:.....cm LENGTH:.....cm

SKETCH (including measurements in cm, location of den(s), marking areas and trees, den)

MARKING SITE(s):..... LATRINE(s):..... HOW MANY ON CAMPSITE? MS:..... L:.....

OLD (dry):..... FRESH (wet): ..... SMELL?:..... SCENT MARK(s):.....

TRACKS?:..... RUB MARKS?:..... TRAMPLED PLANTS?..... SCRATCH WALL?:.....

BEHAVIOR OF OTTERS SEEN?

WHERE FIRST SEEN **: ON LOG? ..... ON BANK?..... IN DEN?..... IN WATER?:.....**

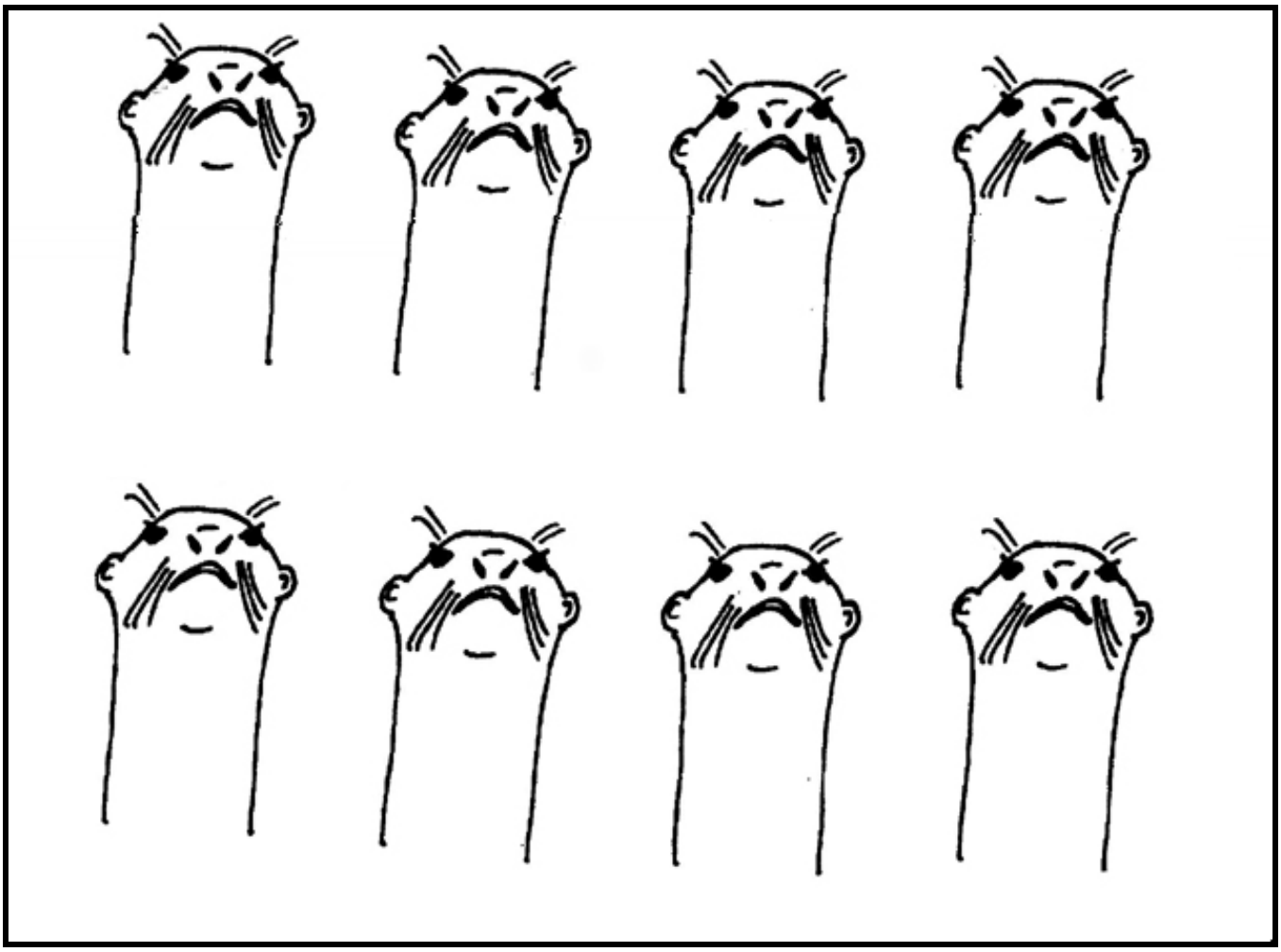
SOUNDS**: HAH?..... SNORTS?..... SCREAMS?..... COOS:..... OTHER?:.....**

ACTION**: APPROACH?:..... AVOIDANCE?..... PERISCOPE?..... PANIC?:.....**

ACTIVITY**: FISHING?:..... SWIMMING?..... FEEDING?:..... GROOM?:..... REST ASHORE?.....**

LAST SEEN**: GO ASHORE?..... GO INTO DEN?..... SWIM AWAY?..... HIDE?:.....**

<u>THROAT PATTERN(s)</u> SKETCH: GOOD?..... POOR?.....
(Note age class. Note sex of adult <u>only if confirmed on land</u>)



<u>COMMENTS</u>:

E. Rivers Surveys

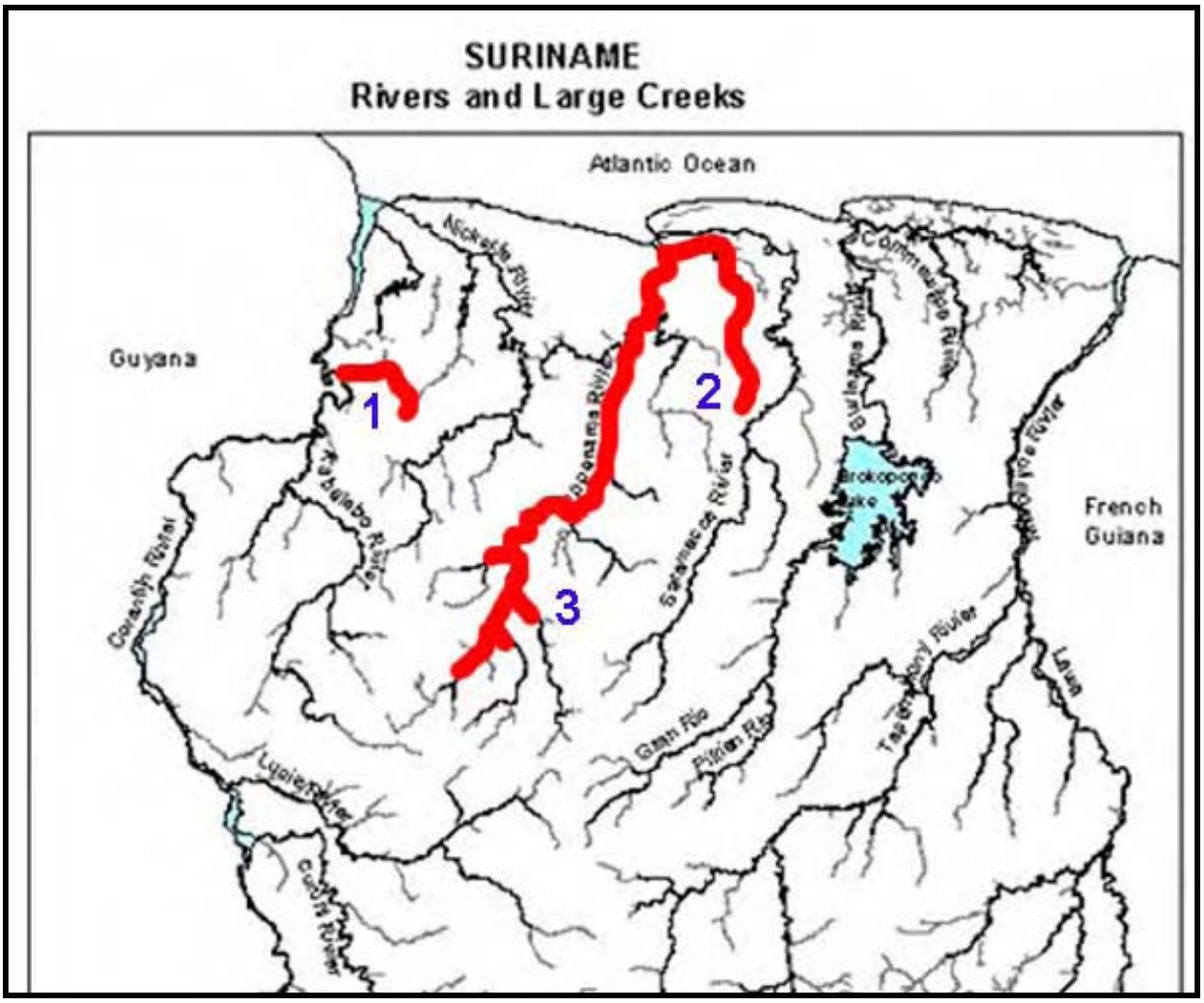
***Rivers surveyed*:**

- Suriname: 1) Kaburi Creek (Corantyne River tributary). 2) Upper Coppename River 3) Upper Cusewijne River Nature Reserve. (see map)
- Guyana: 1) Upper Rupununi River, around Karanambo Ranch. 2) Bat Creek and a portion of the Rewa River (Rupununi River).(see map)

Rivers Surveyed in Suriname

KEY:

1. Kaburi Creek, tributary Corentyne River
2. Upper Cusewijne River Nature Reserve
3. Upper Coppename River (Central Suriname Nature Reserve)



River Surveys in Suriname

1. Kaburi Creek, Corantyne River

*A. **Background:***

- **The area**: Kaburi Creek is located on the Corantyne river in West Suriname just north the Carib Indian settlement of Washabo (N 05°.15'. 586, W 057°.12'.782). It was the site if the first studies of Giant otter in the wild (Duplaix, 1980) and was chosen for it high otter population and, at that time, very low human disturbance.

- **Habitat types**: Vegetation along the banks of small forest creeks such as Kaburi Creek can be divided into the following categories:
    - *Riverbank high forest*. The mesophytic rain forest grows to the creek's edge and tall Mora tropical hardwood trees (*Mora excelsa*) are seen. High banks guard the forest from seasonal flooding. Riverbank high forest is found in patches along the first 3 km of Kaburi Creek. Otters prefer lower lying areas with some undergrowth.
    - *Mixed marsh and high swamp forest.* Xerophytic floodable swamp forest is lower than riverbank high forest and is flooded during the rainy season to a depth of 2 m or more. Tall trees such as pencil-thin Pina palms (*Euterpe oleracea*), or hydrophytic trees such as babun trees (*Virola surinamensis*), and mataki trees (*Symphonia globulifera*) predominate as well as dense stands of thorny keskesmaka palms (*Bactris maraja*). The thick clay soil drains slowly and it is usually poor otter habitat.
    - *Low marsh forest*. Floodable swamp forest may be under water for most of the year. It is largely composed of thick vegetation and few small trees. In more open areas the Mauritius palm (*Mauritia flexuosa*) is seen, standing tall among the floating grass islands common in this habitat. The soil drains well when the ground is above water level and it is used by otters during the dry season.
    - *Grass islands and floating meadows*. Floating grass mats, usually composed of *Ipomoea reptans* are found in the more open areas of the creek. These are fishing spots highly favored by both the Indians and otters: Arawaboo Pond, Swallow Pond, Karekouya Pan, Monkey Pan. (see map)
    - Kaburi Creek is also characterized by high ground "islands" of marsh forest and high swamp forest that are dry year around or flooded only at the height of the rainy season. They are located at wide intervals. Such areas are prized by both Indians and Giant otters as dry season campsites.

- **The creek:** It is a small black water creek that narrows to a few meters in width as it meanders along its winding 13 km east/southeasterly course, until it eventually disappears into a densely vegetated swamp due south of Nanni Lake.

The first 6km of the creek are tidal, the level of the water rising and falling up to c. 30cm daily.

B. Findings

- **Area surveyed:** The entire 16-km navigable length of the creek was surveyed repeatedly durine our six visits between September 2000 and November 2002 (see lists)

- **Fauna**: Even though it is a relatively narrow black water creek in its upper reaches, above 14 km from the mouth, the variety of the successive habitats makes Kaburi Creek a rich environment for a wide variety of forest and swamp species, particularly birds. These species are seldom seen farther north in the coastal savannahs where the effects of agriculture, hunting and habitat loss have taken their toll. This mosaic of successive habitats promotes biodiversity, making the Kaburi Creek area that is valuable for conservation purposes.

- **Otters:**
  Background:

In March 2001 we only caught brief glimpses of otters, also a group of three, further upstream near Lana Swamp and they tried to actively elude us by submerging under vegetation along the banks.
In November 2002, two groups of otters were seen: one near the entrance of Kaburi Creek, the other 14 km upstream.
Campsites. There were otter campsites along the creek in areas of higher ground. Some were in use with fresh markings, others were not but had been used during the last dry season as evidenced by the old fish scales in the latrines used by the otters.
The very large campsite at Frenchman's Landing (not in current use in 2000, but it was used again in 2002) had also been a site in 1976-1978 which indicates that campsites may be used intermittently over many decades. Also it is the only suitable spot of dry land in a 2-kilometer stretch of low floodable swamp forest. Virtually every Giant otter "core area" along Kaburi is close to such grass mat fishing area: Swallow Pond (Km 5.16), Arawaboo Pond (Km 7), Lana Swamp and Creek (Km 8), Karekouya Pan (Km 10), and Monkey Pan (Km 12). The only exception is the Winana Creek otter group (Km 14.6) which has access to a shallow savannah swamp nearby instead.
Several other campsites are in use sporadically along the creek, including several with dens that show fresh digging marks. The otters return to the creek after the wet season in late August, ready to have their cubs.
These fresh campsites are spaced into four "territories" along Kaburi all the way up to Winana Creek (Km 14.5) in roughly the same areas they used in the past. Groups that have access to creeks and permanent swamps are seldom seen on Kaburi even during the dry season -- probably spending most of their time fishing in the shallow pools left in the forest as the waters recede and the fish become vulnerable. When these dry out the otters take up their seasonal residence on the creek again but still retreat to the forest when approached.
Giant otter groups. During our surveys we established that there were both resident and transient otters in the creek. When the following tables and maps are analyzed, one can see that the otters during the '00-'01 dry season centered their activities in three areas: Dawalloo-Swallow Pond (Km 4.5-5.52), Lana Swamp and Creek (Km 7.6 – 8.48), and Lucas Landing-Winana Creek (Km 13.9-15.1). Campsites and dens were visited and used regularly in these areas.
Since we spent relatively little time in the creek with only seven one-week visits and since the otters became increasingly shyer over the 2-year period, we were not able to identify the neck patterns of all the otters we saw.
We were able to identify four clearly delineated territories:
Aiwa Group. The first 2.5 km of the creek do not have active campsites even though otters are sighted passing through. A solitary individual was seen here in September 2000 and in November 2000.
Two otters were glimpsed entering Kaburi Creek in January 2001. We believed at that time that these otters lived up Oralli and Firestick creeks near the swamps and no longer used their old campsites still visible in this area of the creek. This area has the highest level of human habitation and disturbance. However, starting in

February and March 2001, and again during the next dry season in November 2002, the otters marked these old campsites in the Oralli Creek area.
Dawalloo-Swallow Pond Group (Km 4-6.2) The three individuals seen here in September 2000 were not sighted again until November 2002 but they were marking several campsites in the area and using a den on every visit except in March 2001.
Big Bend-Lana Creek Group (Km 6.81-8.48). There were active campsites and dens this area on every visit. Otters were sighted here briefly in March 2001 and in March 2002. This, with the Winana Group below, was the most active group on the creek with 3 dens and 6 campsites that were visited regularly during the dry season. The proximity of Lana Creek that connects with a large swamp makes it ideal habitat.
Monkey Pan-Winana Group (Km 11 -15) Winana Creek is at the very top of Kaburi and has the lowest level of human disturbance. The campsites in the area were in use on 5 of our 7 visits. The campsites in this area were active during the whole season from September through March just as they had been in 1976-1978. In January 2001, two otters were seen in the Monkey Pan grass-mat area swimming downstream and were not shy.
In November 2002 a group of seven otters was seen above Winana Creek (Km 14.6) where they had an active den. Two otters rushed out of the den where they may have been cubs. This group was observed for 10 minutes and showed little fear, swimming close to the boat unlike the groups further downstream. .

- **Human use and human threats Kaburi Creek:**
The People. Within easy reach of local Carib and Warrau Indian fishermen and hunters, the creek has been exploited on a sustainable yield basis for decades. Only the manatee (*Trichechus manatus*) was hunted to extinction in this creek some 40 years ago (James Lingaard, pers. comm., 1978). The manatee is said to still occur in Nanni creek and Nanni Lake just north of the creek although I did not see them there in 1977.
Along the first kilometer where the creek is still wide there are two Indian settlements on the high northern banks. The camps were built when the soil of the kitchen gardens around Washabo became infertile, a normal occurrence after five years when the thin layer of forest soil is cultivated. The kitchen gardens of these two camps are not visible from the creek extending into the forest behind the camp. A few dug-out canoes are pulled out onto the river bank as the creek residents do not use outboard motors.
Three Washabo families now live in the creek permanently (Km 0.8, 0.3, 4.37) and six others have kitchen gardens which they visit regularly which have temporary camps (Km 1.59, 2.3, 2.48, 3.6, 4.5, 9.82).
The STINASU camp at Km 4.85 is also a large clearing with pole shelters. The site belongs to the Lingaard family of Washabo and also has a kitchen garden close by. This camp is masked by a stand of trees from the creek but is placed only 20m downstream from Hummer Pond a prime Giant otter fishing area.
Hunting and Fishing. The use of Kaburi Creek by the Washabo people and others, has increased dramatically since the 1970s and now the creek banks show

signs of human use, new and old, over much of their length all the way up to Winana Creek 15 km upstream (see list). Many of these campsites, both temporary lean-tos and more permanent structures, are in prime otter habitat, some on otter campsites. The otters seem to shun their old campsites when they have been used by humans, for a season at least.

The hunting camps include: One at Ayarina (Km 5.52), two at Awaraboo (Km 7.09, 7.26), two at Frenchman's Landing including one with an old logging site (Km 9.66, 9.85), and six more between Km 12 and 14.6., all used by fishermen and hunters at irregular intervals.

Logging. Directly upstream from the permanent camps (Km 3) are several large clearings where the tall Mora hardwoods (*Mora excelsa*) were cut down as well as areas that were cleared for logging earlier. These logging concessions were granted to Guyanese loggers by the Washabo captain and the locals provided the labor used to fell the timber. (By law, only the government can issue logging concession licenses but in this case, it seems, the Washabo captain took the initiative.) These areas were seen in 2001 as denuded clearings along the muddy bank (Km 1.78, 2.2, 2.15, 2.83, 9.85) but by 2003, secondary growth had masked them.

An old logging site, just north of Frenchman's Landing (Km 8), has only a narrow opening onto the creek. It was in use in September 2000, as evidenced by a fresh pile of small logs by the bank. This is of concern as it is located far upstream and the transport of the logs down the length of the creek causes serious disturbance.

A new logging site (up Monkey Pan Creek) that appeared far upstream (Km 12) in early 2002, was still in use in November 2002. Commercial logging under Suriname license, the first time in 40 years, is being done for a sawmill in Apura, without the permission of the Indians in Washabo. Portions of the creek are now cluttered with logs slowly floating downstream (see photo).

Wildlife Trapping. Near the top of the creek (Km 13.3) we found a macaw smugglers' camp in September 2001. Nearby, a thin *Euterpe* palm had its fronds tied together. The smugglers hide inside the frond shelter and brandish a tame macaw tied to a pole through the leaves to attract wild macaws flying over. They catch the scarlet macaw attracted by the noise with a noose on another pole, quickly sever one of its wing tendons or pull out its primary wing feathers, and throw it down to their partner below who stuffs the bird into a small wire mesh cage. Scarlet macaws (protected in Suriname) are the species of choice but other species of macaws are also captured. Experienced smugglers can quickly catch many birds in this manner.

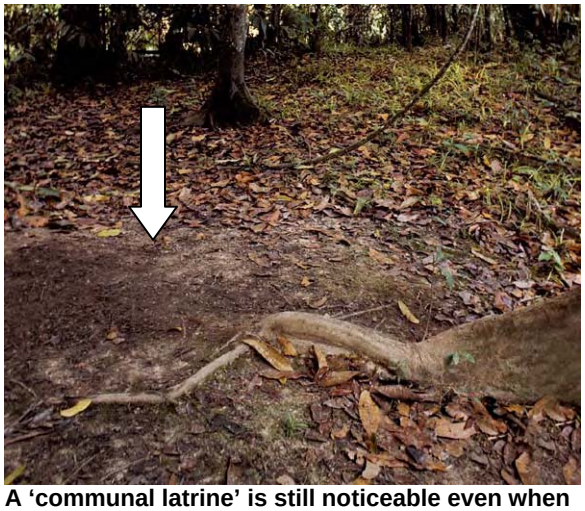
Later we met the Guyanese smugglers who were operating in the creek without the permission of the Washabo captain, and we told them that they were breaking the laws of Suriname and Guyana by illegally capturing and exporting protected CITES species without the proper permits. We asked that they return to Washabo to obtain permission. They did not return while we were there.

Giant otter campsites, Kaburi Creek (Suriname) #1

Such open areas, cleared of vegetation, are Giant otter 'campsites.' (all photos on this page are all from Kaburi Creek, Suriname)

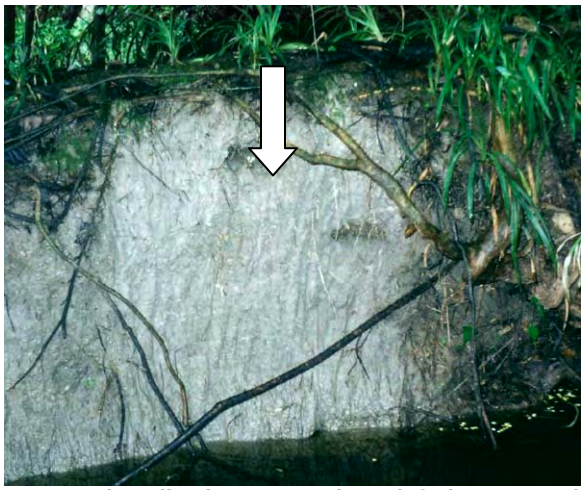
Campsites are often located at a bend in the creek, near a small creek entrances, or near a swampy area in the forest behind the site.

A 'communal latrine' is usually on the edge of a campsite and is used by all the members of the group to urinate and defecate. The scats are then kneaded into the substrate, a long-lasting territorial olfactory signal.

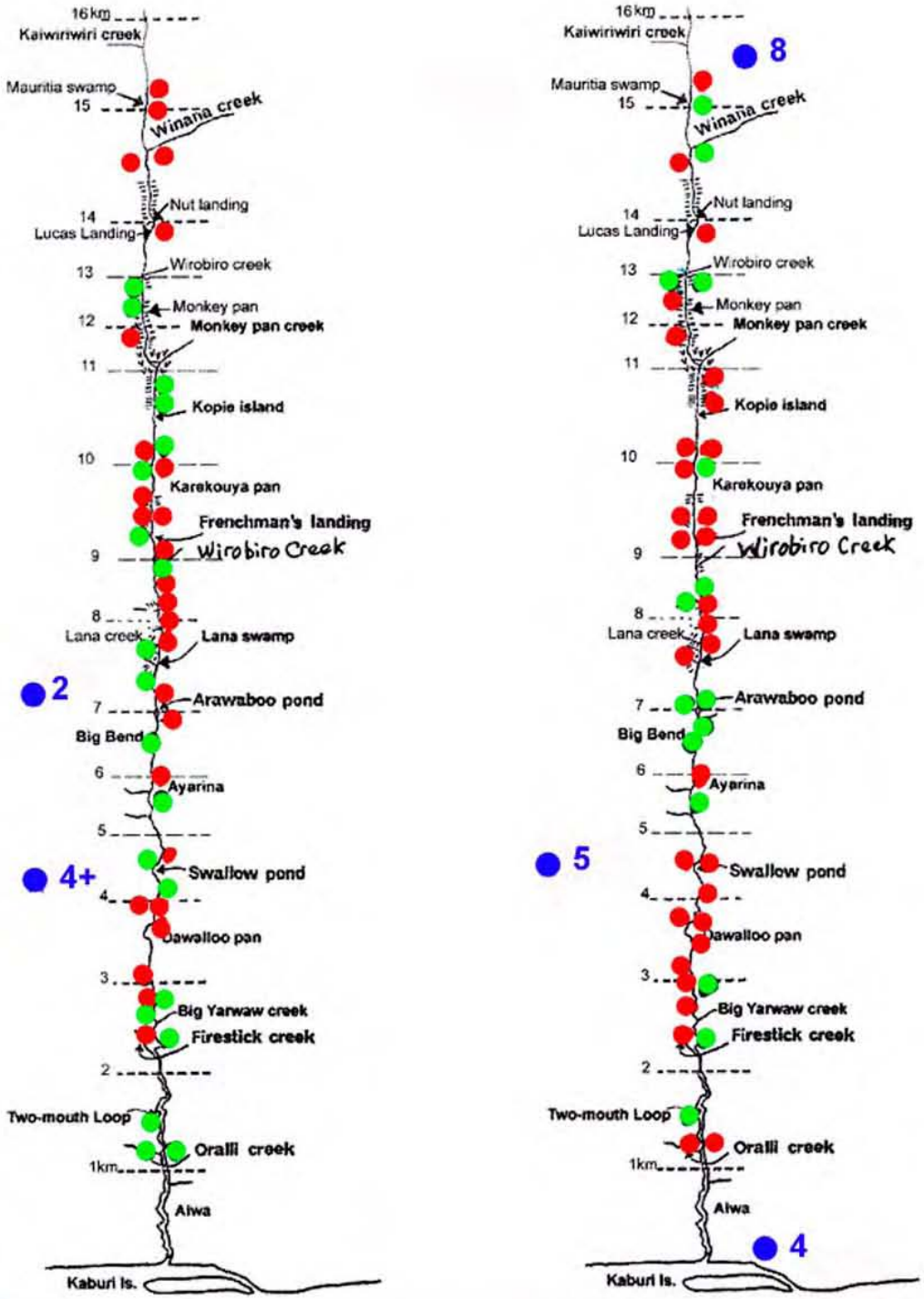


A 'communal latrine' is still noticeable even when the otters no longer visit a site, for instance during the rainy season when they abandon the creek and go deep into the flooded forest.

Some campsites are hidden behind Mokomoko *Montrichardia arborescens* with only a narrow access point.



A 'scratch wall' where otters have left deep scratch marks on the bank as part of their territorial marking behavior. It may or may not be near a campsite.



Giant otter Sites on Kaburi Creek, Suriname (map not to scale)
March 2002 (left), November 2002 (right)

KEY: ● = site in use, ● = site not in use, ● = otter sighting and number of otters seen

Giant Otter sites on Kaburi Creek Sept. 2000 – Nov. 2002

KEY: Campsites: Not in use = ○, Flooded = F Dens: In use = ■, Not in use = □
Latrine = L, Tracks = T, Scratch wall = S, Otters sighted = ✚

	Site	Sept.	Nov.	Jan.	Feb.	March	March	Nov.	
Place Name	**No.**	**'00**	**'00**	**'01**	**'01**	**'01**	**'02**	**'02**	**GPS coordinates**
Creek entrance Aiwa		✚	✚	✚				✚	N05°.15.628' W057°.12.748'
Oralli Creek	45R	○□	○□	○□	● L □	○□	●□	○□	N05°.16.146' W057°.12.262'
Oralli Creek	46L	○□	○□	○□	● L □	○□	●□	○□	N05°.16.127' W057°.12.276'
2-Mouth Bend	44R	○	○	○	○	○	●L	●L	N05°.16.146' W057°.12.262'
Tight Bend X-over	43X	○	○	○	●L	○	●L	●LS	N05°.16.082' W057°.11.895'
Firestick C. X-over	42X	○	○	○	○	●T	○	○	N05°.16.205' W057°.11.312'
Before Xover site	48R						●■	○□	N05°.16.255' W057°.11.491'
X-over site	41X	○	●L	○	○	●L	○	●L	N05°.16.212' W057°.11.358'
Big Yarwaw Creek	40R						●L	●LS	N05°.16.161' W057°.11.275'
Big Yarwaw Creek	39R		○	○✚	○	○✚	○	○	N05°.16.144' W057°.11.294'
Above Dawalloo Loop	38L		● L ■✚	○	○	○	○	○	N05°.16.453' W057°.11.376'
Above Dawalloo Loop	37L		●L	○	○	○	○	○T	N05°.16.447' W057°.11.373'
Above Dawalloo Loop	36R		●L□	○□	○□	○□	○□	○□	N05°.16.463' W057°.11.362'
Above Dawalloo Loop	35L	✚●L	○	○	●L	○	●L	○✚	N05°.16.474' W057°.10.308'
Swallow Pond	34R						●L✚	○	N05°.16.275' W057°.10.109'
Swallow Pond	33R		●L	**F**	○	**F**	**F**	○	N05°.16.238' W057°.10.027'
Ayarina (nr Pingo)	32L						●L	○	N05°.16.318' W057°.09.848'
Ayarina (nr Pingo)	31L	✚●L	○	●L	●L	○	○	○	N05°.16.320' W057°.09.849'
Big Bend	30R	●L	●L✚	**F**	●L	○	●L	●L	N05°.16.577' W057°.09.190'
Near Big Bend	49L							●LS	N05°.16.33.5 W057°09.08.8'
Below Arawaboo	29L					○	○	●	N05°.16.830' W057°.09.012'
Below Arawaboo	28R		●L	**F**	●L	○	**F**	●T	N05°.16.826' W057°.09.006'
Lana Swamp	27L	●L	○	○	○	○	○	○	N05°.17.043' W057°.08.924'
Lana Swamp	26L		● L ■	○□	● L ■	●■✚	**F**	●S	N05°.17.086' W057°.08.859'
Below Lana Creek	47L						●L ✚	●S	N05°.17.095' W057°.08.714'
Lana Creek	25R	■	■	■	?	□	■	□	N05°.17.100' W057°.08.812'
Above Lana Creek	24L	●L	○	○	○	○	●L	●L	N05°.17.094' W057°.08.744'
Above Lana Creek	23L	--	●L	○	○	○	○	○	N05°.17.094' W057°.08.744'
Above Lana Creek	22L	--	--	--	--	● L ■	**F**	● L ■	N05°.16.926' W057°.08.357'
Frenchman's Landing	21L	○□	● L ■	● L □	● L □	○□	**F**	○□	N05°.16.587' W057°.07.557'
Frenchman's Landing	20L						●L □	○□	N05°.16.575' W057°.07.561'
Frenchman's Landing	19L	○□	○□	○□	○□	○□	○□	○□	N05°.16.587' W057°.07.557'
Above Karekouya	18R	○	○	○✚	○	○	●L	○	N05°.16.288' W057°.07.405'
Above Karekouya	17R	○	○	○	○	○	○	○	N05°.16.251' W057°.07.396'
Above Karekouya	16L	○	○	○	○	○	○	○	N05°.16.253' W057°.07.374'
Above Karekouya	15R	○	○	○	●L	○	○	○	N05°.16.244' W057°.07.382'
Kopie Island	14L	○	○	○	○	○	●L	○	N05°.16.015' W057°.07.038'
Kopie Island	13R	●L	○	○	○	○	○	○	N05°.15.995' W057°.07.016'

Place Name	No.	'00	'00	'01	'01	'01	'02	'02	GPS coordinates
Kopie Island	12R	○	○	○	○	○	●L	○	N05°.15.993' W057°.06.998'
Kopie Island	11L	○	○	○	●L	○	○	●L	N05°.15.987' W057°.07.003'
Kopie Pan	10L	--	--	--	○	○	●L	○	N05°.15.779' W057°.06.589'
Above Kopie Pan	9L	--	--	--	●L	○	●L	○	N05°.15.776' W057°.06.591'
Monkey Pan	8R	○	○	○✚	○	○	○	○	N05°.15.678' W057°.06.248'
Below Wiropiro C.	7R						●L	●	N05°.15.608' W057°.05.526
Below Wiropiro C	6BL							●L	N05°.15.35.7'W057°.05.32.4
Below Wiropiro C.	6R						●L	○	N05°.15.608' W057°.05.526'
Lucas Landing	5R	--	● L ■	F	?	● L ■	○□	○□	N05°.15.630' W057°.05.207'
Below Winana C.	4L	○□	○□	○□	○□	● L ■	○□	○□	N05°.15.772' W057°.04.875'
Below Winana C.	3L						○	● L	N05°.15.764' W057°.04.860'
Above Winana C	2L	○	●■✚	●■✚	● L ■	● L ■	○□	● ■✚	N05°.15.928' W057°.04.590'
Above Winana C	1L						○	○	N05°.15.920' W057°.04.588
Mauritia Swamp - top									N05°.15.967' W057°.04.522

Location of Human Use and Giant Otter Sites on Kaburi Creek

KEY: **R** = right side of Creek **L** = left side of Creek **Otters Sighted** = ✚
Sites: Not in use ○, Intermittent Use ○● **Dens**: Not in use □, Intermittent Use ■□
Human Use: Permanent Camp ▲, Temporary Camp △, Kitchen Garden o
Logging ▣, Old Logging ⊡

Place Name	Site	Use '00-'01	Human Use
Creek entrance - Aiwa		✚	
Aiwa			▲o Bamboo
Aiwa			▲o Vincent
Oralli Creek	2	○●□	
Oralli Creek	2B	○●□	
Below 2-Mouth Bend			△
Below 2-Mouth Bend			o
2-Mouth Bend	2-mouth	○	
Tight Bend X-over	X-over	○●	
Above Tight Bend			⊡ and path
Below Firestick Creek			⊡
Below Firestick Creek			⊡△
Below Firestick Creek			▲o
Below Firestick Creek			o
Firestick Creek X-over	X-over	○●	
X-over site	XI	○●	
Big Yarwaw Creek			⊡△
Big Yarwaw Creek	X	✚○	
Big Yarwaw Creek			▲o
Big Yarwaw Creek			Path to Washabo
Dawallo			▲o McIntosh
Dawallo			△o
Above Dawalloo Loop	1B	○●■	
Above Dawalloo Loop	1A	○●	
Above Dawalloo Loop	1C	○●	
Above Dawalloo Loop	1	✚○●	
Below Swallow Pond			▲ Stinasu Camp
Swallow Pond	II	○●	
Ayarina (near Pingo)	3	✚○●	
Pingo Camp			△
Big Bend	BB	○●	
Below Arawaboo	IV	○●	
Arawaboo Pond			△
Above Arawaboo			△

Location	Place Name	Site	Use '00-'01	Human Use
7.61L	Lana Swamp	2	○●	
7.71L	Lana Swamp	V	✚○●■	
7.77R	Lana Creek	Lana	□■	
8.0L	Above Lana Creek	5	○●	
8.01L	Above Lana Creek	VI	○●	
8.48L	Above Lana Creek	Top	○●■	
9.66L	Before Frenchman's L			△
9.77L	Frenchman's Landing	VII	○●■	
9.78L	Frenchman's Landing	4C	○□	
9.85L	Frenchman's Landing			⊡△
9.95R	Above Karekouya Pan	6	✚○	
9.96R	Above Karekouya Pan	7	○	△ on otter site
9.82L	Above Karekouya Pan			▲o
9.99L	Above Karekouya Pan	8	○	
9.99R	Above Karekouya Pan	I	○●	△ on otter site
10.6L	Kopie Island	9	○	
10.65L	Kopie Island	10	○●	
10.65R	Kopie Island	10B	○	
10.7L	Kopie Island	11	○●	
11.4L	Above Kopie Pan	2	○	
11.4L	Above Kopie Pan	2B	○●	
12.0R	Monkey Pan	12	✚○	△ on otter site
12.1L	Monkey Pan/Creek			▲
13.3R	Wirobiro Creek			△ Bird trappers
13.9R	Lucas Landing	VIII	○●■	△ on otter site
14.1 L	Nut Landing			▲ + forest path
14.6L	Winana	13	○●■	△ on otter site
15.1	Winana	14	✚○●■	
Km 15.2	Mauritia Swamp - top			

Mammals and birds observed along Kaburi Creek and in the Washabo area, Sept. '00 – November, '02

KEY: * denotes animals rarely seen or of special concern
● = seen, ○ = heard, T = tracks, N = nesting

Mammals	**Sept 00**	**Nov 00**	**Jan 01**	**March 01**	**Sept 02**	**Nov 02**
Tamandua *	●					
Squirrel Monkey	●	●	●	●	●	
Capuchin	●	●	●	●	●	
White faced capuchin	●		●			
Howler monkey	○	○		○	○	○
Spider monkey *	○	○		○	○	○
Golden-handed tamarin		●				
White-faced saki			●			
Paca		●				
Agouti	●	●	●	●	●	
Tayra *	●		●			
Giant otter*	●	●	●	●	●	●
Neotropical river otter*	●	●	●	●	●	●
Sac-winged bat	●	●	●	●	●	●
Fish-eating bat	●	●	●	●	●	●
White-lipped peccary	●					
Red Brocket deer					●	
Tapir*					T	
Birds						
Tinamidae						
Great tinamou			○	○	○	○
Little tinamou	○					
Variegated tinamou	●	○		○		
Podicipedidae						
Pied-billed grebe	●	●		●		
Phalacrocoracidae						
Neotropical cormorant	●				●	
Anhingidae						
Anhinga	●	●	●	●	●	●
Ardeidae						
White-necked heron	●	●		●	●	●
Snowy egret	●					

Capped heron		●	●			
Striated heron *	●	●		●	●	●
Chestnut-bellied heron	●					
Yellow-crowned night heron	●			●		
Rufescent tiger heron	●	●		●	●	●
Tri-colored heron		●		●		
Pinated bittern*						●
Cochleariidae						
Boat-billed heron *	●	●			●	●
Threskiornithidae						
Green ibis *	●	●	●	●	●	●
Anaditae						
Muscovy duck				●		●
Cathartidae						
King vulture *	●			●		
Black vulture	●			●		●
Turkey vulture	●	●	●	●	●	●
Greater yellow-headed vulture	●	●		●	●	●
Accipitridae						
Swallow-tailed kite *	●		●	●	●	●
Double-toothed kite	●			●		
Plumbeous kite	●			●	●	●
Gray-headed hawk			●			
Roadside hawk		●	●	●		●
Gray hawk	●	●	●	●		●
Zone-tailed hawk*			●			
White hawk	●			●		
Black-collared hawk	●	●		●	●	
Crane hawk	●					
Harpy eagle *			●			
Pandionidae						
Osprey	●	●	●	●		●
Falconidae						
Laughing falcon	●				○	○
Barred forest falcon	●					●
Black caracara			●	●		●
Red-throated caracara	●	●	●	●		●
Orange-breasted falcon				●		

Green-rumped parrotlet			●			
Golden-winged parakeet	●	●	●	●		●
Black-headed parrot	●	●	●	●		
Blue-headed parrot	●		●	●		●
Dusky parrot	●	●	●			●
Yellow-headed parrot	●		●			
Orange winged parrot	●	●	●	●		●
Mealy parrot	●	●	●		●	●
Red fan parrot*	●		●	●		●
Opisthocomidae						
Hoatzin *	●	●	●	●		●
Cuculidae						
Squirrel cuckoo				●	○	●
Black bellied cuckoo	●					
Little cuckoo			●	●		
Greater ani	●	●	●	●	●	●
Smooth-billed ani	●				●	●
Striped cuckoo	●			●		
Strigidae						
Crested owl	○					
Spectacled owl			○	○		○
Tropical screech owl	○	○				○
Nyctibiidae						
Greater potoo	○	○	●			
Common potoo	○		○	○		
Caprimulgidae						
Blackish nightjar	○			○		
Pauraque				○		
Apodidae						
Short-tailed swift	●	●	●	●	●	●
Fork-tailed palm swift	●	●				●
Trochilidae						
Rufous-breasted hermit	●	●	●	●	●	
Long-tailed hermit	●	●		●		
Straight-billed hermit	●			●	●	●
Reddish hermit	●	●	●			
Little hermit			●	●	●	
Black-throated mango	●					
Blue-tailed emerald	●	●	●	●		

Gray-breated sabrewing			●			
Blue-cinned sapphire			●			
Black-eared fairy				●		
Trogonidae						
White-tailed trogon	●	●	●	●	●	●
Violaceous trogon	●	●	●	○	●	
Black-tailed trogon		●				
Alcedinidae						
Ringed kingfisher	●	●	●	●	●	●
Amazon kingfisher	●	●	●	●	●	●
Green kingfisher		●	●	●	●	
Green and rufous kingfisher	●	●	●	●	●	●
Pygmy kingfisher	●	●		●		●
Momotidae						
Blue-crowned motmot	●		●	●		○
Galbulidae						
Brown jacamar	●	●	●	●	●	●
Green-tailed jacamar	●	●	●	●	●	●
Paradise jacamar	●	●	●		●	
Bronzy jacamar			●			
Yellow-billed jacamar						●
Bucconidae						
White-necked puffbird	●					●
Pied puffbird	●	●		●		
Black nunbird	●	●	●	●	●	●
Swallow-wing	●		●	●		
Ramphastidae						
Guianan toucanet		●		○		
Black-necked aracari	●	●	●	●		
Green aracari	●		●			●
Channel-billed toucan	●	●	●	●		●
Red-billed toucan	●	●	●	●	●	●
Picidae						
Arrowhead piculet			●	○	●	●
Yellow-throated woodpecker	●	●	●			
Chestnut woodpecker	●		●			
Ringed woodpecker	●	●		●		
Crimson-crested woodpecker	●			●		
Lineated woodpecker			●	●	●N	○

Cream colored woodpecker		●		●		●
Red-necked woodpecker			●			
Dendrocolaptidae						
Wedge-billed woodcreeper	●	●		●	●	●
Straight-billed woodcreeper	●	●		●	○	○
Buff-throated woodcreeper	○	●	●	●		○
Streaked woodcreeper						●
Furnariidae						
Speckled spinetail	●					
Plain-crowned spinetail				●		○
Rufous-talied foliage gleaner						●
Formicariidae						
Great antshrike			●			
Mouse-colored antshrike	●	○	●	●	●	
Amazonian antshrike	●					
Cinereous antshrike	●	○	●		○	
Fasciated antshrike			●			
Pygmy antwren	●		●			
Streaked antwren	●		●			
White-flanked antwren	●			●	●	●
White-fringed antwren				●		
Gray antwren	●		●			
Black-headed antbird	●	○	○	●		○
Warbling antbird	○	○	●	●	○	○
Ferruginous-backed antbird	○	●				
Black-chinned antbird		●	●	●	●	●
Silvered antbird		●	●	●	○	●
Black-faced antthrush		●				○
Thrush-like antpitta		●	○			
Cotingidae						
Screaming piha	○	●	○	○	○	●
Purple-throated fruitcrow	●	○	●	●	○	
Bare-necked fruitcrow	●			●		
Pipridae						
Crimson-hooded manakin	●	●	●	●	●	●
Tyrannidae						
Tropical kingbird	●	●	●	●	●	●
Boat-billed flycatcher		●				
Rusty-margined flycatcher			●	●	●	
Great kiskadee			●	●		●

Lesser kiskadee	●	●		●	●N	●
Cinnamon attila	●	●		●	●	●
Cinereous mourner	○	○				
Grayish mourner	●			○	●	
Gray-crowned flycatcher				●		
Common tody flycatcher	●					
Yellow-breasted flycatcher	●	○				
Spotted tody flycatcher	●					
Short-tailed tyrant		●				
Pale tipped tyrannulet	●	●	●			
Yellow-bellied elaenia				●		●
Hirundinidae						
White-winged swallow	●	●				
Gray-breasted martin	●		●	●	●	
White-banded swallow	●				●	●
Barn swallow	●			●		
Troglodytidae						
Coraya wren	○			●	●	○
Buff-breasted wren	○		○			○
House wren				●	●	
Musician wren *	○		○			
Mimidae						
Black capped mocking thrush						●
Turdidae						
Cocoa thrush						●
Sylviidae						
Tropical gnatcatcher	●		●	●		○
Vireonidae						
Ashy-headed greenlet				●		
Icteridae						
Shiny cowbird	●					
Crested oropendola	●	●	●	●	●	●
Green oropendola	●		●	●		
Yellow-rumped cacique	●			●		●
Red-rumped cacique				●		●
Epaulet oriole				●		
Parulidae						
River warbler				●		●

Bananaquit	○	○		●	○	○
Thraupidae						
Purple honey creeper	●	●	●			
Red-legged honeycreeper	●					
Green honeycreeper	●		●			
Blue dacnis		●			●	
Turquoise tanager	●		●	●		
Purple-throated euphonia	○					
Violaceous euphonia		●		●N		
Blue-gray tanager	●	●	●	●	●	
Palm tanager	●	●		●		●
Silver-beaked tanager	●	●	●	●		●
White-lined tanager	●		●			
Fulvous-crested tanager	●	●				
Grey-headed tanager		●		●		
Hooded tanager	●		●			
Fringillidae						
Blue-black grosbeak	●	●	●	●		
Grayish saltator			●		●	●
Yellow-green grosbeak				●		
Lesser seed finch				●		
Variable seedeater				●		
Lesson’s seedeater				●		
Chestnut-bellied seedeater				●		
Blue-black grassquit				●		

2. Upper Coppename River (Central Suriname Nature Reserve)

A. Background:

- **The area**: This target freshwater ecoregion, one of the main watersheds of the Guianan region, is located in central eastern Suriname and is protected by the Central Suriname Nature Reserve. With uninhabited, largely intact rainforest above Raleigh Falls, the Upper Coppename River offers a unique opportunity to see pristine habitat.

- **Habitat types**: Along most of the Upper Coppename River there is riparian rainforest cover to the water's edge with a *Mora*-dominated forest in areas where the banks are high.
  On the Linker Coppename River after the junction with the Midden Coppename, mixed marsh and high swamp forest are found. Xerophytic floodable swamp forest is lower than riverbank high forest and is flooded during the rainy season to a depth of 2 m or more. Tall trees such as pencil-thin Pina palms (*Euterpe oleracea*), or hydrophytic trees such as babun trees (*Virola surinamensis*), and mataki trees (*Symphonia globulifera*) predominate as well as dense stands of thorny keskesmaka palms (*Bactris maraja*).

- **The river**: The Upper Copppename is a wide river (>200m in places) with slow meanders. Soon after Hoof Falls, there is a large tributary Tangimama River which was not visited during this survey. After Langa Falls, Adampada Creek forks east and after Tonken Falls, the Rechter Coppename forks west. Further upstream, the Coppename splits into the Midden and Linker Coppename rivers (which has the Midden Coppename Rivers as a large tributary).
  There is minimal bank erosion due to the hard sandy and granitic boulder substrates. The upper portions of the Coppename River are bisected by numerous boulder outcrops and plateaus, mixed with sharper volcanic andesite outcrops, and low buttresses with rapids and shallow waterfalls, making navigation difficult. In the rainy season there are significant water level changes in both vertical and horizontal planes when the low-lying forest is flooded deep inland. The water flow and rapids become turbulent and dangerous whereas in the dry season, 4 months later, the water levels may be so low that only the deeper portions of the main river are navigable and even the large tributaries are inaccessible.

B. Findings:

- **Area surveyed**: The area surveyed covered Hoof Falls all the way to Kakantrie Falls on the Linker Coppename (see maps). The lower portions of Adampada Creek and the Rechter Coppenamewere were also surveyed but were soon bisected by high falls. The Midden Coppename was inaccessible during both visits. (see maps)

- **Fauna**: The biodiversity of this area is extraordinary. Normally shy animals such as primates, macaws, anteaters and iguanas are seen often and up close and are not alarmed by humans unless approached to within 10 m or so. The Upper Coppename River remains a stronghold for species in high densities which have been extirpated by hunting or animal collecting elsewhere. These include all the endemic primate species, peccaries, tapir, jaguar and puma (see mammal and bird lists). The presence of many large predators is generally a sign of high mammal densities overall. Large groups of macaws, parrots, and toucans are common – species that are sensitive to hunting pressure too. Harpy eagles are present.
  At the end of the dry season in October, when the water level had dropped 5m and the forest was dry, there were fewer monkeys and parrots seen, probably due to the absence of fruiting trees. Capybara and dwarf caiman, normally shy during the day, were seen in close to the river as their forest creeks and swamps dried out.

- **Otters:** *June 2002*: 2 Giant Otters (a pair?) were sighted on the Linker Coppename tributary near a freshly marked campsite. They headed into the flooded swamp forest almost immediately. We found and measured 14 otter campsites of which 4 were in recent use: Rechter Coppename R.: 5 sites (2 in use), Linker Coppename R.: 6 sites (2 in use), Adampada Creek : 3 sites. The banks of the river were flooded in most places by about 2m of water at the height of the rainy season and only the sites on the highest banks were seen. (see sighting lists and maps).
  Sept-October 2002: Giant otters were seen 5 times, Neotropical otters, once. We found and measured 16 Giant otter campsites of which 12 were in recent use: Rechter Coppename River: not visited; Linker Coppename: 7 sites (4 in use), one group of 7 otters seen at junction of Midden Coppename R. (not visited); Adampada Creek: one group of 3 otters seen, 2 sites (in use) but too shallow to check on other sites; Tonken Falls: a pair of 2 Giant otters seen twice and a pair of Neotropical otters once : 5 Giant otter campsites (4 in use) and over 30 single scats on boulders and sand patches, 3 Neotropical otter sites (in use); near Sidonkrutu Falls: 2 otters seen; Langa Falls: 2 sites (in use).
  In the dry season on the Upper Coppename River, in areas where boulders and small rapids are present, Giant otters have an unusual single-scat marking behavior which was observed in 1976 (Duplaix, 1980) and was observed again during our visit in September 2002. This is discussed in greater detail in the chapter: Giant Otter Behavior and Ecology, new findings and discussion.

- **Human use and human threats**: Balata bleeders in the 50s and 60s and biological and hydrological teams visited the area until the 1970s and set up temporary camps that have now disappeared. There has been no commercial logging due to the many rapids making extraction and transport difficult. We observed a commercial fishing expedition (using poles, lines but no nets) up to the Tonken Falls area by the local people from Bitagron far downstream,. Fishing targets only a few species: *Hoplias* (aniumara), Pacu, Maroko, Peacock bass (tukunari), piranha and tiger catfish. No evidence of regular hunting was seen although a few spent cartridges were found just above Hoof Falls.

C. Conclusions

All the conditions necessary for the long-term viability of the fauna and flora are present. The area is large enough to contain pristine rainforest habitat necessary to maintain biodiversity, including large endangered vertebrates such as jaguar, puma, Giant and Neotropical otters, Giant armadillo, and it also has a very rich bird biodiversity (see lists). The Upper Coppename River merits long-term research efforts. Its relative accessibility from Raleigh Falls, which reduces expenses, and its pristine rainforest and wildlife make it an ideal study area for Giant Otters and many other species of mammals and birds.

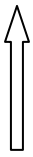
Giant otter marking behavior, Upper Coppename River (Suriname) #1

In Suriname, in granite plateau areas, such as on the Upper Coppename River, Giant otters mark their territory differently during the dry and wet seasons.

Giant otters use granite boulders near rapids to leave single scats which are not trampled. Many of them contain crab remains, a common prey during the dry season.

If the boulder is large and flat, the scats may be trampled, These dry out quickly and soon only fish scales and parts remain (white arrow). A fresh jaguar scat is also visible (yellow arrow).

Another boulder midtream with a large area of dried fish scales. Giant otters have only been observed using boulders for marking in rocs q



uickly find such scats and leave only fish scales behind.

Neotropical otter signs and scats, Upper Coppename River (Suriname) #2

Neotropical otter *Lontra longicaudis* is smaller and shyer than the Giant otter. The male is usually solitary. Both species may share the same habitat.

Neotropical otter tracks on wet sand. The nails are clearly visible.

Neotropical otter scats under a rocky overhang near the water. Upper Coppename River, dry season.

Neotropical otter 'sand castle': a pile of sand is scratched together and urine or scent is deposited at the center. Upper Coppename River, dry season.

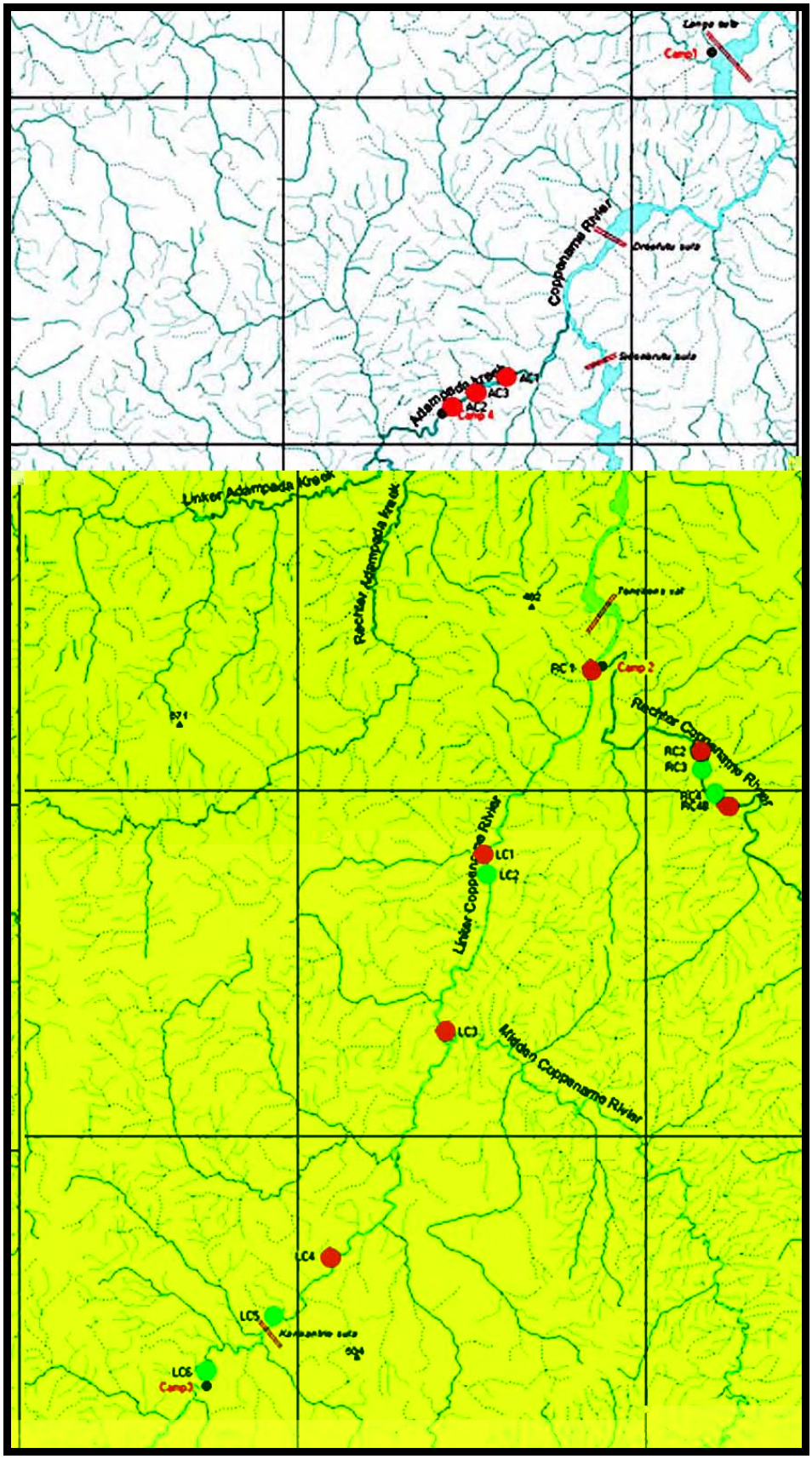
Large Giant otter scat (bottom) as compared to much smaller Neotropical otter scat (top). Both scats contain fish and crab remains. Upper Coppename River, Tonken Falls, dry season.

Compact, firm Neotropical otter scat (left) and much larger Giant otter scat (right). Both species may use the same boulder or beach. Upper Coppename River, dry season.

Upper Coppename River, Rechter and Linker Coppename Giant Otter sites, June 2002

Rainy season: many creeks flooded and Midden Coppename not visited.

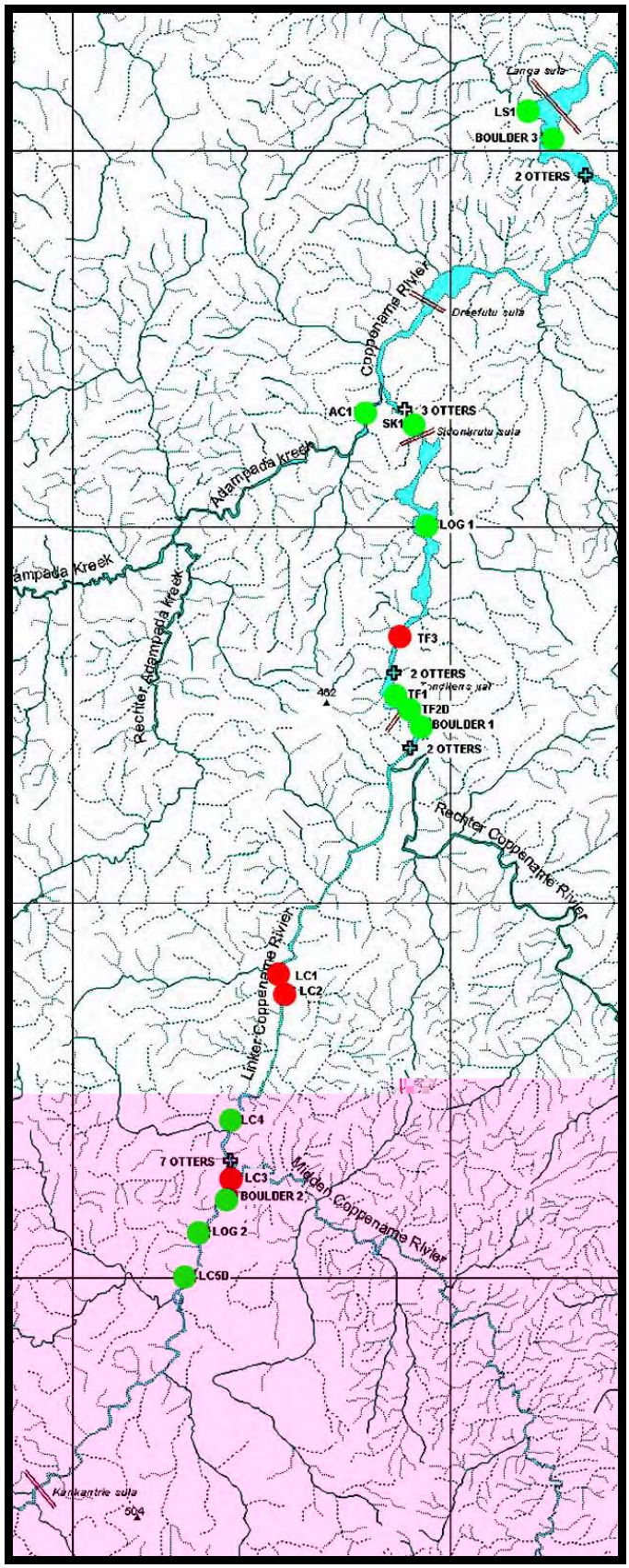
KEY: = campsite in use, = campsite not in use



Upper Coppename River, Rechter and Linker Coppename Giant Otter sites, October 2002

Dry season: Adampada C., Rechter and Midden Coppename not accessible

KEY: = campsite in use, = campsite not in use



GIANT OTTER SITES, UPPER COPPENAME RIVER: 3 -14 JUNE and 18 SEPT.- 2 OCT.'02

GIANT OTTER SITES UPPER COPPENAME RIVER -- 3 -14 JUNE, 2002

SITE # TAG #	LOCATION	BANK	OLD	IN USE	SCAT	TRACKS	DEN(S)	NR CREEK SWAMP	OTTERS SEEN	FLOODED	NOTE
Rechter Coppename R.											
RC1 #5	N 4.23.784 W 56.31.736	J	✔								at junction
RC2 #53	N 4.20.788 W 56.28.430	R	✔					✔		✔	
RC3 #52	N 4.19.274 W 56.27.209	L		✔	✔	✔	✔	✔		✔	
RC4 #51	N 4.18.319 W 56.27.164	L		✔	✔		✔	✔			
RC4B #50	N 4.18.343 W 56.27.184	L		✔	✔		✔	✔			50m from #51
Linker Coppename R.											
LC1 #48	N 4.18.389 W 56.34.794	L	✔					✔			
LC2 #47	N. 4.18.111 W 56.34.761	L	✔					✔			sand bank
LC3 #46	N. 4.13.329 W 56.35.907	J	✔								junction
LC4 #45	N. 4.07.973 W 56.37.409	I	✔								island
LC5 #44	N. 4.05.277 W 56.39.821	L		✔	✔	✔		✔	**2, shy**		very fresh
LC6 #43	N. 4.04.897 W 56.40.676	R		✔	✔		✔				
Adampada Creek											
AC1 #42	N. 4.33.102 W 56.32.349	L	✔							✔	old
AC2 #41	N. 4.31.981 W 56.33.994	I	✔								island
AC3 #40	N. 4.32.237 W 56.33.696	I	✔								island

KEY: **L**: left bank, R: right bank, **J**: junction, **I**: island, **B**: boulder

GIANT OTTER SITES UPPER COPPENAME RIVER -- 18 SEPT.- 2 OCT., 2002

SITE # TAG #	LOCATION	BANK	OLD	IN USE	SCAT	TRACKS	DEN(S)	NR CREEK SWAMP	OTTERS SEEN	FLOODED	NOTE
Langa Sula											
LS1 #49	N. 4.41.227 W 56.28 046	R		✔	✔	✔					very fresh
LSBOLD	N. 4.44.421 W 56.21.745	R		✔	✔	✔					very fresh
Adampada Creek and Sidonkrutu Falls											
SK1 #100	N. 4.33.571 W 56.31.951	I		✔	✔	✔			**3, shy**		island
AC1 #42	N. 4.33.102 W 56.32.349	L		✔	✔	✔					very fresh
Tonken Falls											
LOG SPR	N. 4.30.623 W 56.30.640	L		✔	✔						log in creek
	N. 4.26.353 W 56.31.783	river							**2, shy**		near island
TF1 #99	N. 4.25.917 W 56.31.045	I		✔	✔						island
TF2D #98	N. 4.25.917 W 56.31.045	I		✔	✔						island
TF3 #97	N. 4.27.791 W 56.30.872	I	✔		✔						island
2OTTF2	N. 4.24.426 W 56.31.120								**2, not shy**		
TFBOLD	N. 4.25.935 W 56.31.897	B		✔	✔						boulder
Linker Coppename R.											
LC1 #48	N 4.18.389 W 56.34.794	L	✔					✔			
LC2 #47	N. 4.18.111 W 56.34.761	L	✔					✔			sand bank
LC3 #46	N. 4.13.329 W 56.35.907	J	✔						**7(family)**		junction
LC4	N. 4.14.832 W 56.35.463	B		✔	✔						boulder
LC5	N. 4.10.497 W 56.36.840	R		✔	✔		✔				resting den
LC6	N. 4.12.712 W 56.35.957	B		✔	✔						boulder
LC8	N. 4.11.607 W 56.36.443	B		✔	✔						log
Coppename R.											
2GOTTR	N 4.39.870 W 56.27.834	river							**2, not shy**		

Mammals and birds observed on the Upper Coppename River (Central Suriname Nature Reserve)

NOTE: * denotes animals rarely seen or of special concern

KEY: T = tracks, N = nesting, ● = seen, ○ = heard

Mammals	**Coppename June '02**	**Coppename October '02**
Bearded saki*	●	
Squirrel monkey	●	●
Capuchin	●	●
White-faced capuchin	●	
Howler monkey	●	●
Spider monkey *	●	●
Golden-handed tamarin	●	
White-faced saki*	●	
Paca	●	
Agouti	●	●
Tayra *	●	●
Giant otter	●	●
Neotropical river otter*	●	●
Sac-winged bat	●	●
Fish-eating bat	●	●
White-lipped peccary	●	
Giant anteater*	●	T
Tapir*	T	T
Jaguar		T
Ocelot	T	
Birds		
Tinamidae		
Great tinamou	○	○
Little tinamou	●	
Phalacrocoracidae		
Neotropical cormorant	●	●
Anhingidae		
Anhinga	●	●
Ardeidae		
White-necked heron	●	●
Greater white egret		
Snowy egret	●	
Capped heron	●	●
Striated heron *	●	●
Yellow-crowned night heron	●	
Rufescent tiger heron		●

Cattle egret	●	
Cochleariidae		
Boat-billed heron *	●	
Ciconiidae		
Jabiru Stork*	●	
Threskiornithidae		
Green ibis *	●	●
Anaditae		
Muscovy duck	●	
Masked duck*		
Cathartidae		
King vulture *	●	●
Black vulture		●
Turkey vulture	●	
Greater yellow-headed vulture	●	●
Accipitridae		
Swallow-tailed kite *	●	
Plumbeous kite	●	●
Pearl kite	●	
Roadside hawk	●	
Gray hawk	●	●
Yellow-headed caracara	●	
White hawk	●	●
Great black hawk		●
Black-collared hawk	●	●
White-tailed hawk		
Crane hawk	●	
Harpy eagle *	●	●
Pandionidae		
Osprey	●	●
Falconidae		
Laughing falcon	●	
Crested caracara		
Black caracara	●	●
Red-throated caracara	●	●
Orange-breasted falcon		
Bat falcon	●	●
Cracidae		
Little chachalaca	●	○

Marail guan		○
White-headed piping guan	●	●
Black curassow	●	●
Phasianidae		
Marbled wood quail		○
Psophiidae		
Sunbittern *	●	●
Heliornithidae		
Sun grebe		
Jacanidae		
Wattled jacana		
Charadriidae		
Pied lapwing	●	
Scolopacidae		
Solitary sandpiper	●	●
Spotted sandpiper		●
Columbidae		
Scaled pigeon	●	
Pale-vented pigeon	●	●
Ruddy pigeon		
Gray-fronted dove	●	●
Psittacidae		
Blue and Yellow macaw	●	●
Scarlet macaw *	●	●
Red and green macaw	●	●
Red-bellied macaw	●	
Red-shouldered macaw		
White-eyed parakeet	●	
Brown-throated parakeet	●	●
Painted parakeet	●	●
Golden-winged parakeet	●	●
Black-headed parrot	●	●
Blue-headed parrot	●	
Dusky parrot	●	●
Yellow-headed parrot	●	
Orange winged parrot	●	●
Mealy parrot	●	●
Red fan parrot*	●	●
Caica parrot*	●	●

Cuculidae		
Squirrel cuckoo	●	●
Striped cuckoo		
Greater ani		
Smooth-billed ani		
Strigidae		
Spectacled owl	●	○
Nyctibiidae		
Greater potoo	○	
Common potoo	○	
Caprimulgidae		
Blackish nightjar	●	●
Pauraque		
Ladder-tailed nightjar	●	
Apodidae		
Short-tailed swift	●	●
Fork-tailed palm swift		●
Trochilidae		
Rufous-breasted hermit	●	
Long-tailed hermit	●	●
Straight-billed hermit		●
Reddish hermit	●	
Little hermit	●	
Fork-tailed wood nymph	●	
Blue-tailed emerald	●	●
Black-eared fairy	●	●
Booted racquet-tailed		●
Gray breasted sabrewing		●
Black-throated mango		●
Trogonidae		
Black-tailed trogon	●	
White-tailed trogon	●	●
Violaceous trogon	●	●
Alcedinidae		
Ringed kingfisher	●	●
Amazon kingfisher	●	●
Green kingfisher	●	●
Green and rufous kingfisher	●	●
Pygmy kingfisher	●	●
Momotidae		
Blue-crowned motmot	●	

Galbulidae		
Great jacamar		●
Brown jacamar	●	
Green-tailed jacamar	●	●
Bucconidae		
Spotted puffbird		
White-necked puffbird		●
Black nunbird	●	●
Swallow-wing	●	●
Ramphastidae		
Black-necked aracari	●	●
Green aracari	●	●
Channel-billed toucan	●	●
Red-billed toucan	●	●
Picidae		
Arrowhead piculet	●	
Waved woodpecker	●	
Crimson-crested woodpecker	●	
Lineated woodpecker	●	
Red-necked woodpecker	●	
Cream-colored woodpecker		
Dendrocolaptidae		
Wedge-billed woodcreeper		○
Straight-billed woodcreeper		
Buff-throated woodcreeper	○	○
Furnariidae		
Yellow-throated spinetail		
Plain crown spinetail		●
Plain xenops	●	
Formicariidae		
Great antshrike	●	
Mouse-colored antshrike	●	●
Cinereous antshrike	●	●
Fasciated antshrike	●	
Streaked antwren		●
Black-chinned antbird		
Warbling antbird		●
Ferruginous-backed antbird		
White-browed antbird		
Black-faced antthrush	●	
Thrush-like antpitta	●	○

Cotingidae		
Screaming piha	●	●
Spangled cotinga*		●
Thrush like shifornis	●	
Black-tailed tityra		●
Purple-throated fruitcrow	●	○
Bare-necked fruitcow	●	
Pipridae		
Golden-headed manikin	●	●
Thrush-like manakin	●	
Tyrannidae		
Tropical kingbird	●	●
Boat-billed flycatcher	●	
Rusty-margined flycatcher	●	●
Yellow-breasted flycatcher		
Great kiskadee	●	
Lesser kiskadee	●	●
Cinnamon attila	●	●
Common tody flycatcher	●	
Forest elaenia		●
Hirundinidae		
White-winged swallow	●	●
White-banded swallow	●	●
Blue and white swallow	●	●
Gray-breasted martin		●
Troglodytidae		
Coraya wren		●
Buff-breasted wren	●	●
Musician wren *	●	○
White-breasted wood wren		●
Mimidae		
Tropical mockingbird		
Black-capped mocking thrush		
Sylviidae		
Tropical gnatcatcher	●	
Vireonidae		
Rufous-browed pepper shrike		●
Icteridae		
Crested oropendola	●	●
Green oropendola	●	●

Yellow-rumped cacique	●	●
Red-rumped cacique		
Giant cowbird		
Parulidae		
Bananaquit	●	●
Thraupidae		
Blue dacnis		
Blue-gray tanager	●	●
Palm tanager	●	●
Silver-beaked tanager	●	●
White-lined tanager		
Fulvous-crested tanager	●	
Fringillidae		
Blue-black grosbeak	●	●
Grayish saltator	●	●
Yellow-green grosbeak	●	●
Lesser seed finch	●	
Chestnut-bellied seedeater		
Blue-black grassquit		
Slate-colored seed-eater	●	

River Surveys in Suriname

3. Cusewijne River (Nature Reserve), tributary of the Saramacca River

A. Background:

- **The area:** The Cusewijne River is located in north-central Suriname. The Cusewijne Nature Reserve (formerly the Boven Coesewijne Nature Reserve) was created in 1986 because of its high biodiversity in a relatively small area (27.430 ha). The Cusewijne River is located in north-central Suriname (see map). (For a very detailed description and evaluation of the Reserve see Teunissen *et al.*, 2001.)

- **Habitat types**: The Reserve has a rich diversity of habitats along and near the river that include: open and mixed swamp forest, grass swamps, marsh forest, dryland forest, savanna forest and savannas.

- **The river:** The Coesewijne River is located between the Saramacca and the Coppename Rivers (see map of Suriname rivers) at the transition zone between the Coastal Plain, the Savanna Belt and the Interior Uplands. In its upper reaches in and upstream form the Reserve, it becomes a small, narrow creek.

B. Findings

- **Area surveyed:** We made a brief three-day survey of the Upper Cusewijne River, 8 km below the southern border to 15 km above the northern border (see map).

- **Fauna:** High biodiversity at the level of species. Studies of the flora and fauna showed a diversity of almost 600 species of vascular plants and almost 300 species of vertebrates (Teunissen *et al.*, 2001) . The wetland fauna used to include healthy populations of the globally endangered Manatees, Giant otters, and Spectacled caimans. It also includes many species of water fowl: a rare sighting of masked ducks (*Oxyura dominica*) – see list.

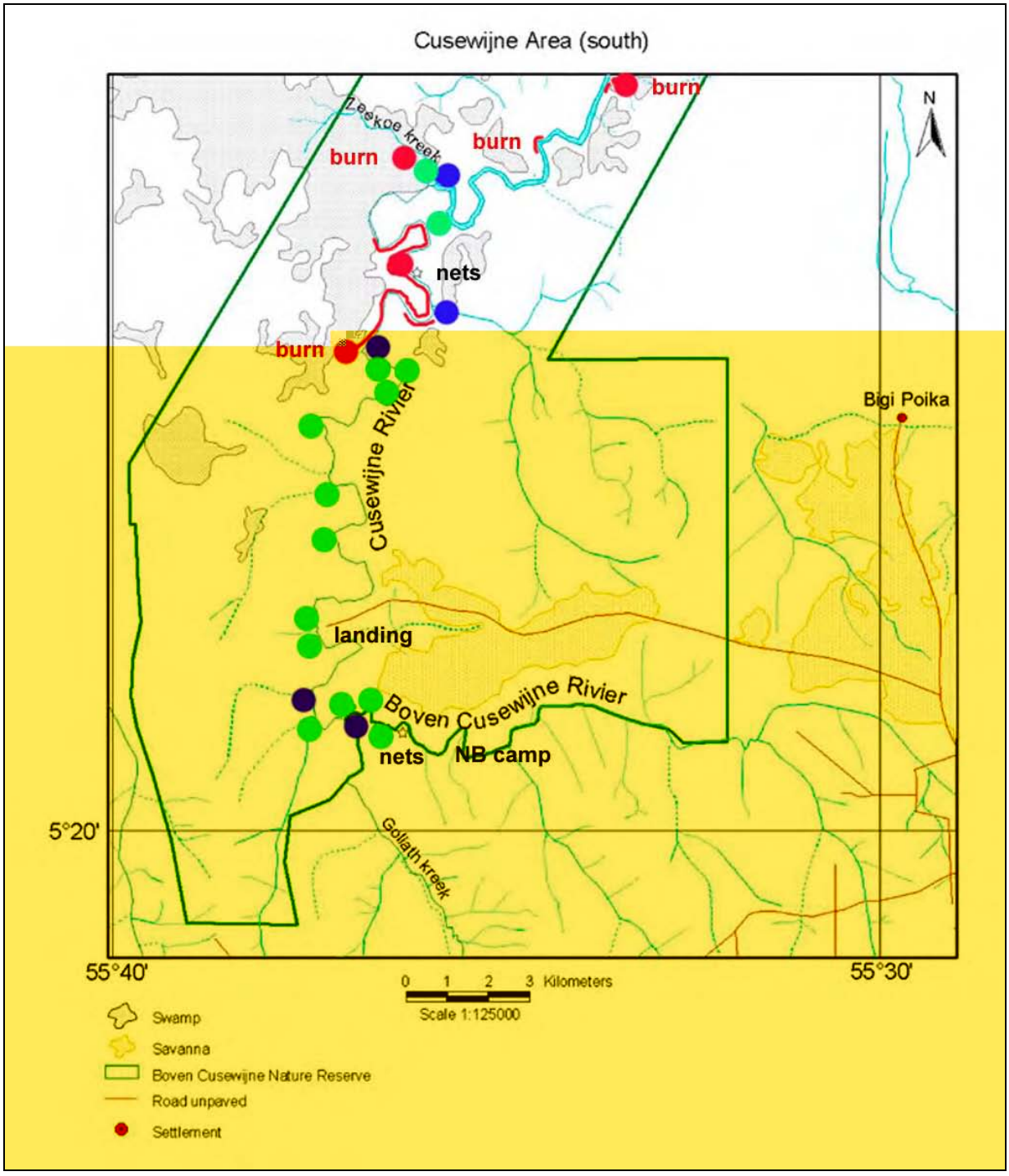
- **The otters:** In 1976-1978 there was a large and healthy resident population of Giant otters (Duplaix, 1980.). This has drastically changed. We only saw one very shy otter in the reserve and one further downstream outside the reserve, for less than a minute each and both showed extreme panic as we approached. No fresh signs of otters were found in the Reserve. All the old campsites are now being, or have been used, as human campsites and most are covered with human refuse and debris.

- **Human use and human threats*:*** In 2001, Teunissen stated “The Upper Coesewijne area shows a great potential to develop nature tourism in combination with cultural tourism at the nearby village of Akarani (Bigi Poika), thus providing also new sources of sustainable income for the Carib community.”

  Apparently, the local Amerindian comm

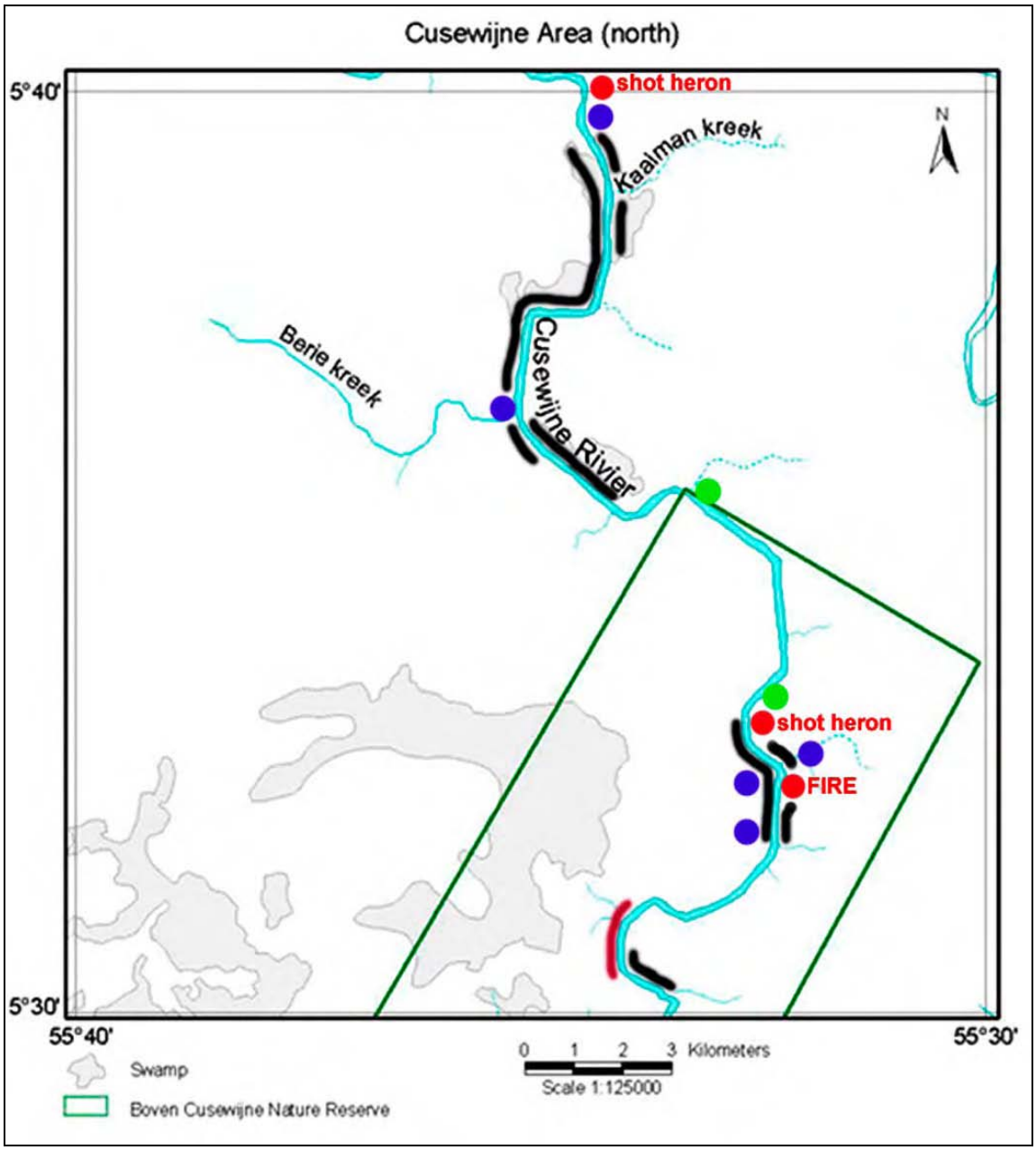
Cusewijne River Nature Reserve (southern section).
No otter sites in use. October 2002

KEY: = old human campsite, = human campsite in use,
= fire or recent burn, = old burnt area



Cusewijne River Nature Reserve (northern section).
No otter sites in use. October 2002

KEY: = old human campsite, = human campsite in use,
= fire or recent burn, = old burnt area



Mammals and birds observed on the Cusewijne River Nature Reserve

NOTE: * denotes animals rarely seen or of special concern

KEY: T = tracks, N = nesting, ● = seen, ○ = heard

Mammals	**Cusewijne October '02**
Squirrel monkey	●
Capuchin	○
Howler monkey	○
Agouti	●
Giant otter	●
Sac-winged bat	●
Birds	
Tinamidae	
Great tinamou	○
Anhingidae	
Anhinga	●
Ardeidae	
White-necked heron	●
Greater white egret	●
Snowy egret	●
Striated heron *	●
Yellow-crowned night heron	●
Rufescent tiger heron	●
Cochleariidae	
Boat-billed heron *	●
Threskiornithidae	
Green ibis *	●
Anaditae	
Muscovy duck	●
Masked duck*	●
Cathartidae	
Black vulture	●
Greater yellow-headed vulture	●
Accipitridae	
Swallow-tailed kite *	●
Gray hawk	●
Black-collared hawk	●
White-tailed hawk	●

Falconidae	
Red-throated caracara	●
Cracidae	
Little chachalaca	○
Phasianidae	
Marbled wood quail	○
Eurypygidae	
Sunbittern *	●
Heliornithidae	
Sun grebe	●
Jacanidae	
Wattled jacana	●
Scolopacidae	
Spotted sandpiper	●
Columbidae	
Ruddy pigeon	●
Gray-fronted dove	●
Psittacidae	
Blue and Yellow macaw	○
Red-shouldered macaw	●
White-eyed parakeet	●
Brown-throated parakeet	●
Black-headed parrot	●
Blue-headed parrot	●
Dusky parrot	●
Orange winged parrot	●
Red fan parrot*	○
Cuculidae	
Squirrel cuckoo	●
Striped cuckoo	●
Greater ani	●
Smooth-billed ani	●
Strigidae	
Spectacled owl	○
Nyctibiidae	
Greater potoo	○
Caprimulgidae	

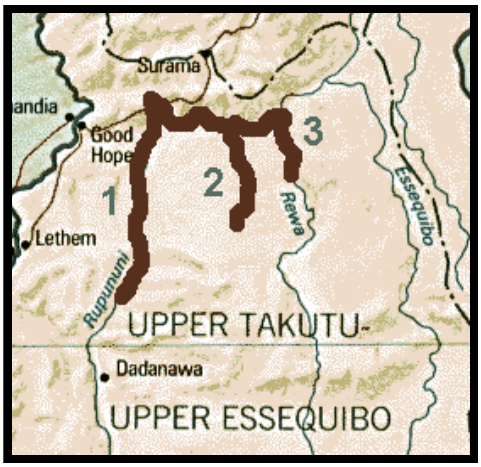
Pauraque	○
Apodidae	
Fork-tailed palm swift	●
Trochilidae	
Rufous-breasted hermit	●
Long-tailed hermit	●
Straight-billed hermit	●
Blue-tailed emerald	●
Trogonidae	
White-tailed trogon	●
Violaceous trogon	●
Alcedinidae	
Ringed kingfisher	●
Amazon kingfisher	●
Green kingfisher	●
Green and rufous kingfisher	●
Pygmy kingfisher	●
Galbulidae	
Green-tailed jacamar	●
Bucconidae	
Spotted puffbird	●
Ramphastidae	
Channel-billed toucan	●
Picidae	
Arrowhead piculet	●
Lineated woodpecker	●
Cream-colored woodpecker	●
Dendrocolaptidae	
Wedge-billed woodcreeper	●
Straight-billed woodcreeper	●
Buff-throated woodcreeper	●

Cotingidae	
Screaming piha	●
Tyrannidae	
Tropical kingbird	●
Yellow-breasted flycatcher	●
Great kiskadee	●
Lesser kiskadee	●
Cinnamon attila	●
Hirundinidae	
White-winged swallow	●
White-banded swallow	●
Troglodytidae	
Coraya wren	
Buff-breasted wren	●
Mimidae	
Tropical mockingbird	●
Black-capped mocking thrush	●
Sylviidae	
Tropical gnatcatcher	●
Icteridae	
Crested oropendola	●
Yellow-rumped cacique	●
Red-rumped cacique	●
Giant cowbird	●
Parulidae	
Bananaquit	●
Thraupidae	
Blue dacnis	●
Blue-gray tanager	●
Palm tanager	●
Silver-beaked tanager	●
White-lined tanager	●
Fringillidae	
Chestnut-bellied seedeater	●
Blue-black grassquit	●

Rivers Surveyed in Guyana

KEY:

1. Upper Rupununi River
2. Bat Creek (tributary of Rupununi River)
3. small portion of Rewa River (tributary of Rupununi River)



River Surveys in Guyana

2. Bat Creek and a short portion of the Lower Rewa River, both tributaries of the Rupununi River

A. Background

- **The areas**: Bat Creek is a tributary on the south bank of the Rupununi River west of Rewa, an Amerindian community. The Rewa River is a tributary on the south bank of the Rupununi River east of Rewa.

- **Habitat types**:
    - *Bat creek* has long stretches of high swamp and low marsh forests, often clogged with very thick stands of water-guava (*Psidium*) on mud flats and *Bombex* trees, making boat access relatively difficult on the lower reaches of the creek. There are stretches of riverbank high forests.

    - *Lower Rewa River*. There is a dominance of *Mora excelsa* forest along the high riverbanks with lower marsh or swamp forest in depressions behind them with swamp trees such ass *Macrobolium acaciafolium*.

- **The rivers**:
    - *Bat creek*. It is a narrow meandering creek, quite narrow in places, that opens up into larger, shallow "ponds" and oxbow lakes along its upstream portions. The substrate is hard sand, similar to that seen in the Upper Rupununi River around Karanambo.

    - *Lower Rewa River*. The riverbed of the Rewa River is rocky with sandy alluvial deposits and rocky outcrops further upstream as it narrows.

B. Findings

- *Lower Rewa River*. The river was surveyed at the onset of the rainy season under torrential rains and flooding for three days after the Bat Creek survey.

- **Fauna:**
  - *Bat Creek.* We made biodiversity assessments including birds and mammal observation lists. In comparison to Kaburi Creek in Suriname and the Rewa River nearby, Bat Creek appears to have a lower biodiversity particularly of birds, primates, reptiles and amphibians. This may be due to seasonal factors (rain, lack of fruiting trees). We observed one tapir and noted 39 narrow gulleys with tracks (some quite old) entering the water indicating a resident population of tapirs.

  - *Lower Rewa River*. The biodiversity assessment along the banks lined with higher rainforest was more diverse than in Bat Creek about 25km to the west. The biodiversity was much richer than on Bat Creek, further west, including conspicuous groups of parrots and macaws. This also corresponds with the findings of Dr. Louise Emmons who considers the Rewa riverine ecosystem to be of global conservation importance (Parker *et al.,* 1993).

- **Otters:**
  - *Bat Creek.* Giant otters were seen twice, (an adult pair, and a single transient) and two more otters were heard fishing in a nearby swamp but not seen. Our visit corresponded with the onset of the rainy season in early April and heavy rainfall, at the time when the resident otters usually leave their creek habitat to follow the seasonal fish migration into the flooded swamps in the riparian forests (Duplaix, 1980, 2001). Of the 46 otter sites seen only 24 showed recent use indicating that the most of the resident otters had already left the immediate area.

    We found and measured 46 otter campsites of which 33 also had dens (some already submerged) clustered into four distinct home ranges (see map and list). Many of these sites were perennial (used over several breeding seasons, some probably for decades) indicating the presence of at least three or more resident *Giant Otter groups.* At least three or four groups of otters appear to reside in Bat Creek. Each territory is separated from by several kilometers where there are no sites, the sites being clustered together near ponds (see list).
    - Bat Creek entrance Group: 10 sites: 3 old (2 dens), 6 in use (5dens).
    - Gold Pond Group: 7 sites: 4 old (4dens), 3 in use (2 dens).
    - Big Kokerite Pond: 12 sites: 5 old (4 dens), 5 in use (5 dens).
    - Big Gwen Pond Group: 17 sites: 8 old (6 dens), 10 in use (10 dens).

    The high incidence of dens being associated with campsites in Bat Creek

is unusual. It is a much higher ratio than in Kaburi Creek (Suriname) and may be a factor of the presence of sandy banks in this creek. Around Karanambo on the Upper Rupununi River where the banks are up to 8m high, there are many more dens than campsites (see Karanambo section).

- *Lower Rewa River*. We located only three otter campsites and two dens on high banks that had not been flooded yet by the rising water level -- many more would have been visible in the dry season. We followed a pair of Giant otters and their cub near the entrance of the river for 12 minutes. After initial alarm they continued downstream and allowed to follow at a distance of c. 50m. Ashley Holland (pers. com.) sighted 14 Giant otter groups and 5 Southern River Otters on the Lower, Upper Rewa River and Kitaro River in mid-February to mid-March 2002 during the dry season.

- **Human use and human threats**:
  - *Bat Creek.* The creek was exploited by *Balata* bleeders up until the 1970s and there was intensive hunting and fishing at that time. The Amerindians from Rewa and Anai still visit the creek to hunt and fish but do not kill the otters. In 1997 the Bat Creek was "purchased" by investors in Georgetown to develop tourist hunting and fishing camps but so far this has not happened as the Rewa villagers have claimed ancestral land rights to the area.
  - *Lower Rewa River.* The lower reaches of the river, up to the first set of rapids and waterfalls, are visited regularly by hunters and fishermen from Rewa. There is also Giant river turtle and iguana egg collecting. There are camps and kitchen gardens along the banks. However the impact on the banks and the biodiversity appear to be minimal.

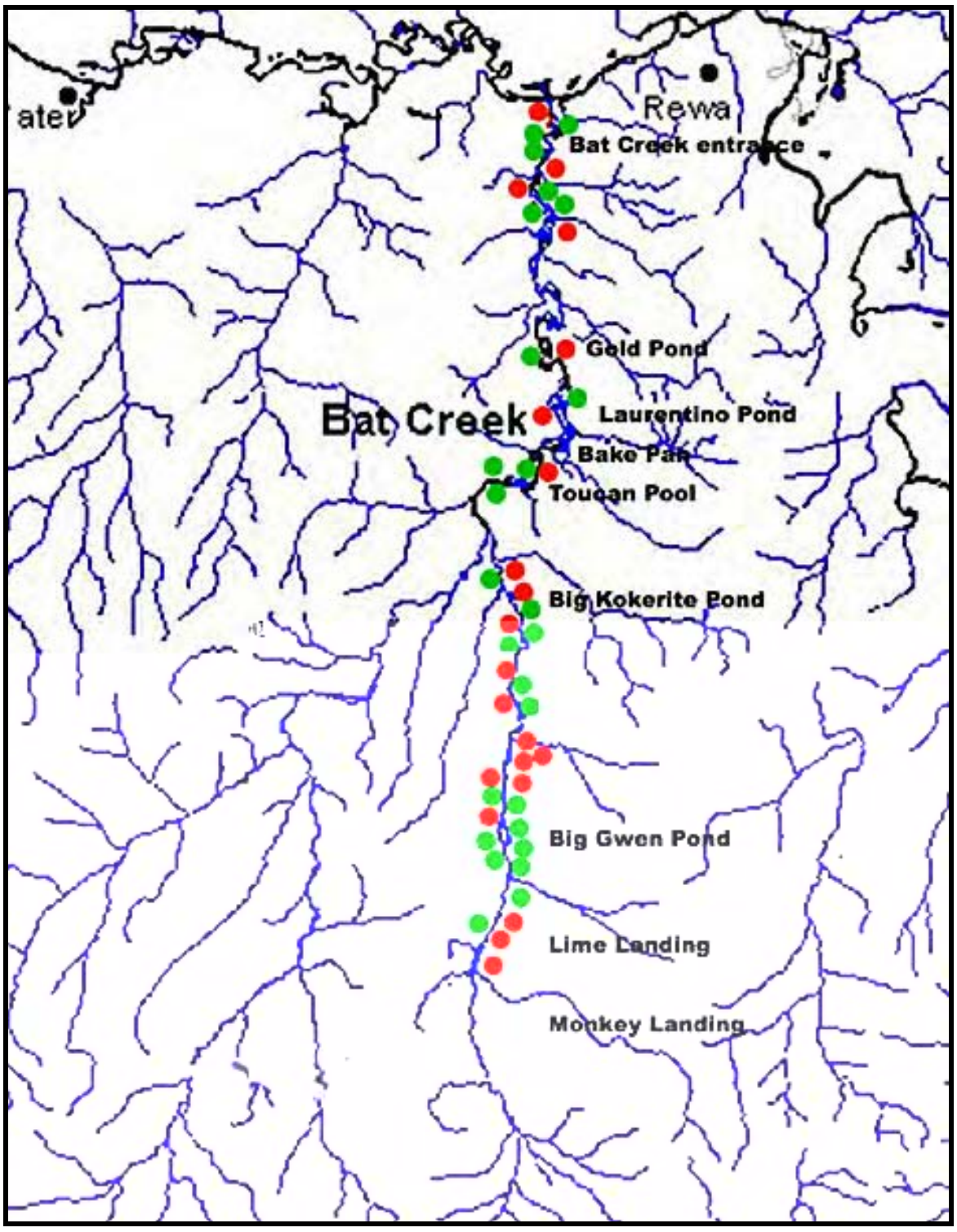
C. Conclusion

Both the lower Rewa River and Bat Creek, due to their protection and limited use by the Amerindian community in Rewa, appear to be protected from overuse, for the time being. Bat Creek is an excellent Giant otter creek with four or five territories present. Many of the sites have dens that show recent use and some family groups probably had cubs there in late 2001.

The lower reaches of the Rewa River system, with its similarities to the habitat found in the Upper Coppename River, is an ideal otter habitat particularly in the uninhabited upper reaches along the Kitaro River.

Giant otter campsites on Bat Creek, Upper Rupununi River, Guyana, April 2002

KEY: = campsite in use = campsite not in use



FOUR GIANT OTTER GROUPS, BAT CREEK, RUPUNUNI RIVER, GUYANA, 14 -21 APRIL 2002

NAME	SITE # TAG #	LOCATION	BANK	OLD	IN USE	MARKS	DEN(S)	NR CREEK SWAMP	OTTERS SEEN	FLOOD	NOTES
Bat Crk - entr.		N 3.51.13.7 W 58.52.15.8									
GROUP 1	BE1 #74	N 3.51.10.2 W 58.52.18.0	L	✔			?		✔	✔	submerged den
	BE2 #73	N 3.51.08.6 W 58.52.21.8	R		✔		✔				den only
	BE3 #72	N 3.51.00.8 W 58.52.20.2	L		✔		?				long site
	BE4 #71	N 3.50.42.4 W 58.52.23.1	L		✔						latrine
	BE5 #70	N 3.50.41.7 W 58.52.21.6	R		?		✔	✔	✔		submerged den
	BE6 #69	N 3.50.36.5 W 58.52.19.3	R		✔		✔				3 dens
	BE7 #68	N 3.50.29.1 W 58.52.19.5	R		✔		✔	✔			in use past month
	BE8 #67	N 3.50.23.9 W 58.52.26.2	L		✔	✔	✔				fresh, tracks
	BE9 #66	N 3.50.19.9 W 58.52.24.9	R	✔			✔				den only
	BE10 #65	N 3.50.07.6 W 58.52.24.9	L	✔			✔	✔			2 dens
Red Hill Pond		N 3.49.47.4 W 58.52.35.3									
Gold Pond 1		N 3.48.53.1 W 58.52.26.4									
GROUP 2	GL1 #64	N 3.49.14.8 W 58.52.43.2		✔			✔	✔			2 dens
	GL2 #58	N 3.48.45.7 W 58.52.17.0		✔			✔				den only
Gold Pond 2		N.3.49.07.8 W 58.52.39.0									
Gold Pond 3		N 3.49.14.0 W 58.52.44.2									
Laurentino Pond											
	LP1 #59	N 3.47.20.9 W 58.52.37.8	R		✔			✔			
	LP2 #57	N 3.48.06.0 W 58.52.34.1	L	✔			✔				2 dens
Bake Pan - top		N 3.46.14.7 W 58.52.02.7									
	BP1 #60	N 3.47.00.0 W 58.52.17.0	L	✔			✔				
Bake Pan - end		N 3.46.58.3 W 58.52.16.7									
Toucan Pool		N 3.46.24.8 W 58.52.16.1									
	TR1 #56	N 3.44.13.3 W 58.43.24.8	R		✔		✔				fresh use

	TR2 #55	N 3.45.0.2.2 W 58.44.22.2	L		✔	✔	✔				smell, scratch
Big Kokerite P.	CAMP 1	N 3.43.35.1 W 58.52.32.1									
GROUP 3	K0 #100	N 3.43.51.7 W 58.52.21.1	R	✔			✔				vertical den
	K1 #99	N 3.45.48.7 W 58.52.22.2	R		✔	✔	✔	✔			3 dens, rub
	K2 #98	N 3.45.41.9W 58.52.24.2	x-over	✔		✔	✔				vertical den
	K3 #97	N 3.45.34.6 W 58.52.30.7	R		✔		✔				in use past month
	K4 #96	N 3.45.24.1 W 58.52.27.3	x-over	✔							
	K5 #95	N 3.45.29.0 W 58.52.05.4	R		✔		✔				vertical den
	K6 #94	N 3.45.29.4 W 58.52.05.3	L		✔		✔				in use past month
	K7 #93	N 3.45.28.0 W 58.52.04.6	L	✔		✔	✔				scratch
	K8 #92	N 3.45.02.4 W 58.52.00.3	R			✔	✔				in use past month
	K9 #63	N 3.46.01.0 W 58.52.36.6	R				✔	✔		✔	sumerged den
	K10	N 3.46.27.6 W 58.52.11.2	L		✔	✔	✔		1		2 dens, rub
	K11 #61	N 3.46.20.2 W 58.52.10.8	R	✔			✔				2 dens, smell
Big Gwen Pond											
GROUP 4	G1 #91	N 3.44.27.0W 58.52.07.9	R	✔							old latrine
	G2 #90	N 3.44.23.8 W 58.52.02.1	R	✔				✔			old latrine
	G3 #89	N 3.43.51.9 W 58.51.50.7	R	✔			✔		2		otters seen nearby
	G4 #88	N 3.43.48.9 W 58.52.01.5	L	✔			✔				den only
	G5 #87	N 3.43.40.6 W 58.52.10.4	L		✔		✔				in use past season
	G6 #86	N 3.43.34.0 W 58.52.17.2	R		✔		✔				in use past month
	G7 #85	N 3.43.36.3 W 58.52.22.1	R		✔		✔				in use past month
	G8 #84	N 3.43.25.8 W 58.52.31.7	R	✔	✔		✔				2 dens in use
	G9 #83	N 3.43.13.9W 58.52.34.2	L		✔	✔	✔				fresh, tracks
	G10 #82	N 3.43.10.4 W 58.52.35.8	L		✔		✔				den is use, rub
	G11 #81	N 3.42.38.6 W 58.52.48.8	L		✔	✔	✔				fresh,long site
	G12 #76	N 3.42.38.6 W 58.52.48.8	L			✔	✔				2 dens only, tracks
	G13 #75	N 03.42.50.2 W 58.52.49.0	L				✔				in use past month
Lime Landing 1		N 3.42.51.4 W 58.53.31.4									

	L1 #80	N 3.48.53.1 W 58.52.26.4	R		✔		✔					long site
	L1B --	N 3.49.14.8 W 58.52.43.2	R	✔			✔					den only
	L1C #79	N 3.48.45.7 W 58.52.17.0	R	✔			✔					not used recently
	L2 #78	N.3.49.07.8 W 58.52.39.0	R		✔		✔					smell, 3 dens
	L3 #77	N 3.49.14.0 W 58.52.44.2	R	✔			✔					old den
Lime Landing 2		N 3.42.32.2 W 58.59.2										
Monkey Island		N 3.41.54.8 W 58.53.45.0										
Bat Creek - end		N 3.41.49.1 W 58.53.42.2										

Mammals and birds observed on Bat Creek, Guyana
April 2002 (beginning of rainy season)

NOTE: * denotes animals rarely seen or of special concern

KEY: T = tracks, N = nesting, ● = seen, ○ = heard

Mammals	**Bat Creek, Guyana April 02**
Squirrel monkey	●
Capuchin	●
Howler monkey	○
Spider monkey *	○
Capybara	●
Giant otter	●
Sac-winged bat	●
Fish-eating bat	●
White-lipped peccary	●
Tapir*	●
Birds	
Tinamidae	
Great tinamou	○
Phalacrocoracidae	
Neotropical cormorant	●
Anhingidae	
Anhinga	●
Ardeidae	
White-necked heron	●
Cattle egret	●
Capped heron	●
Striated heron *	●
Ciconiidae	
Jabiru Stork*	●
Wood stork	●
Threskiornithidae	
Green ibis *	●
Anaditae	
Muscovy duck	●N

Accipitridae	
Swallow-tailed kite *	●
Plumbeous kite	●
Roadside hawk	●
Gray hawk	●
Black-collared hawk	●
Pandionidae	
Osprey	●
Falconidae	
Red-throated caracara	●
Orange-breasted falcon	●
Cracidae	
Little chachalaca	●
Marail guan	●
Black curassow	●
Heliornithidae	
Sun grebe	●
Jacanidae	
Wattled jacana	
Charadriidae	
Pied lapwing	
Southern lapwing	●
Scolopacidae	
Spotted sandpiper	●
Laridae	
Yellow-billed tern	●
Rynchopidae	
Black skimmer	●
Columbidae	
Scaled pigeon	●
Pale-vented pigeon	●
Gray-fronted dove	●
Psittacidae	
Blue and Yellow macaw	●
Scarlet macaw *	●
Red and green macaw	●
Brown-throated parakeet	●

Painted parakeet	●
Golden-winged parakeet	●
Blue-headed parrot	●
Dusky parrot	●
Yellow-headed parrot	●
Orange winged parrot	●
Mealy parrot	●
Red fan parrot*	●
Cuculidae	
Squirrel cuckoo	●
Greater ani	●
Smooth-billed ani	●

Green aracari	●
Channel-billed toucan	●
Red-billed toucan	●
Picidae	
Arrowhead piculet	●
Waved woodpecker	●
Ringed woodpecker	●
Yellow-throated	●
Crimson-crested woodpecker	●
Lineated woodpecker	●
Red-necked woodpecker	●
Dendrocolaptidae	
Wedge-billed woodcreeper	●
Straight-billed woodcreeper	●
Buff-throated woodcreeper	●
Formicariidae	
Mouse-colored antshrike	●
Cinereous antshrike	●
White-flanked antwren	●
Black-chinned antbird	●
Warbling antbird	●
Ferruginous-backed antbird	●
Cotingidae	
Screaming piha	○
Bare-necked fruitcow	●
Tyrannidae	
Tropical kingbird	●
Boat-billed flycatcher	●
Greater kiskadee	●
Lesser kiskadee	●
Cinnamon attila	●
Common tody flycatcher	●
Pale-tipped tyrannulet	●
Drab water-tyrant	●
Rufous-tailed flatbill	●
Hirundinidae	
White-winged swallow	●
White-banded swallow	●
Troglodytidae	
Buff-breasted wren	●
Musician wren *	●

Mimidae	
Black-capped mocking thrush	●
Turdidae	
Bare-eyed thrush	●
Vireonidae	
Rufous-browed pepper shrike	●
Icteridae	
Green oropendola	●
Moriche oriole	●
Yellow oriole	●
Parulidae	
River warbler	●
Bananaquit	●
Thraupidae	
Violaceous euphonia	●
Blue-gray tanager	●
Palm tanager	●
Silver-beaked tanager	●
Burnished-buff tanager	●
Fringillidae	
Blue-black grosbeak	●
Yellow-green grosbeak	●
Chestnut-bellied seedeater	●
Blue-black grassquit	●
Red-capped cardinal	●

River Surveys in Guyana

1. Upper Rupununi River near Karanambo Ranch

A. Background:

- **The area**: The Karanambo Ranch is a 324km² of savannah grasslands and some riverine forest.

- **Habitat types**: Riparian vegetation along the banks of the Upper Rupununi River and its smaller small forest creeks tributaries such as Simuni Creek can be divided into the following categories:

  a. Mixed marsh and high swamp forest. Xerophytic floodable swamp forest is lower than riverbank high forest found along the Lower Rupununi and Rewa rivers and is flooded during the rainy season to a depth of 2 m or more. Tall trees such as pencil-thin Pina palms (*Euterpe oleracea*), or hydrophytic trees such as babun trees (*Virola surinamensis*), and mataki trees (*Symphonia globulifera*) predominate. The thick sand-clay soil drains slowly and leaving clay pans in the forest which retain water well into the dry season.

  b. Low marsh forest. Floodable swamp forest may be under water for most of the year. It is largely composed of thick vegetation and few small trees. In more open areas near the savannah the Mauritius palm (*Mauritia flexuosa*) is seen, standing tall among the floating grass islands common in this habitat. The soil drains well when the ground is above water level.

  c. Oxbow lakes and ponds. Amazon water lilies (*Victoria amazonica*), floating grass mats, usually composed of *Ipomoea reptans,* are found in the more open areas of some of the oxbows such as Akuri Pond. These are fishing spots highly favored by both the Macushi Indians and the otters

- **The river**: The Upper Rupununi River is located in southwest Guyana near the border of Brazil. It is a large meandering river with high clay banks and sand bars with scrub forest and gallery forest bordering the Rupununi Savannah. Numerous shallow oxbow lakes are located in the forests on either side a short distance from the river. The high banks, nearly free of vegetation, are up to 8m above the water level and are gradually eroding in places.

- **Seasonal changes**: In the rainy season there are significant water level changes in both vertical and horizontal planes when the low-lying forest is flooded deep inland. During the dry season, the high (.8m) banks act like a levee or dam wall, shielding the low-lying swamp forest behind it which may be at water level or below with swampy areas. The river appears “walled-in” rather than carved into the river bed itself as noted by Parker *et al*. (1993). Sometimes these levees collapse and the river rushes through the gap filling a shallow oxbow- type lagoon

or pond in the depression behind (eg. Riversburst Pond, – see map). Cut-off meanders and winding river channels over shifting sandbars, create poorly drained habitat from narrow channels through sandbars, to broad patches of open marsh.
In 2003 there was a severe drought when the winter rains failed and the rainy season started late in June. The river sunk to its lowest point, exposing huge sandbars that had not been seen in decades (D. McTurk, pers. comm.). Most of the low-lying areas behind the levees dried out and many trees bore little fruit. Even the shyer animals (coati, jaguarundi, capybara during the day) and birds (trumpeters and guans), came down to the river's edge to drink in the open. Once we saw a jaguarondi rush down the bank to grab a large iguana as it was drinking,

B. Findings

- **Area surveyed**: The Ruppununni River was surveyed from the mouth of the Rewa River to 15 km upstream of the Karanambo ranch a distance of approximately 85km . A particular emphasis was placed on the area, roughly 35km in diameter, around the Karanambo ranch including Simuni Creek and small oxbow lakes (see map).

- **Fauna**: Due to the lack of many fruiting trees in the riparian forest and neighboring savannahs on the eastern side of the Upper Rupununni, the diversity of frugivorous birds (parrots and macaws) and mammals (primates) in the dry season is low whereas, on the western bank up Simuni Creek, which has higher forest these species are more common . Some evidence of larger Black caiman being killed and the carcasses abandonned (bullet holes in skulls). The protected *Araipama gigas* (fish*)* is also poached in the small oxbow lakes that are not actively protected. Guyana has a flourishing animal trade and the absence of some species may also be due to animal collecting in the area (Duplaix, 2001).

- **Human use and human threats**: The Rupununni River has many human settlements along or near its banks, mostly indigenous, and much more river traffic than the similar-sized Coppename River in Suriname. Commercial and subsistence fishing, using both small nets and lines, were regularly seen along the river and there is some recreational fish

and slippery access up a 5m vertical bank, others with a sloping sandy bank (see list and photos). Unlike the otter groups on Bat Creek (Guyana) and Kaburi Creek(Suriname), this group has very few communal campsites. Instead, their latrines were small (<2m diameter), located at the top or the base of the steep bank leading to their den. An adult would trample the fresh scats into the mud before leaving the site.

Group K had only one "typical" communal campsite on Akuri Pond near the river and was observed to use it infrequently. The river and oxbows offered both deeper and very shallow fishing areas and we observed the otters hunting there and catching fish 6-20cm long. During the severe drought of 2003, the otters would spend more time near deeper water pool such as Jersey Pool even though there were 9 very large Black caiman (>3m) residing there as well. We did not see any interaction between otters and caiman, the caiman swimming away slowly or submerging when the otter group fished nearby and carried their catch to a log near the bank.

Group structure. *Pteronura* in Suriname and Guyana are seen in groups ranging in size from two (a pair) to an extended family group of 7 or 8. Solitary animals, usually sub-adults, are transient animals passing through the area that seldom remain for long and avoid contact with resident groups.

Giant otters were identified individually using the variation in white spots and blotches on their necks (see charts of Groups K and S showing the neck patterns of all the otters observed.). After a few weeks' observation it was possible to recognize all 8 individuals in the resident Group K. Easy individual recognition is a great asset in determining territory boundaries and group movements up and down the river on a daily and seasonal basis. We established that there were both resident and transient otters in the Karanambo area.

- *Group K.* The resident group composed of an adult wild pair (Anya and Zhivago) and their four cubs born in late October 2001 (5 cubs were born but 1 cub disappeared in 2002, another in 2003 – see neck charts). This group occupies an area of the Upper Rupununi immediately upstream from the ranch up to and including nearby oxbow lakes/ ponds: Acuri and Romeo Ponds, Nobay Lake, Crane Pond (see map).

  Group K in 2002: one adult pair had 5 cubs in late 2001 (one disappeared when 3-monthsold). The group accepted two hand-reared rehabilitated subadults (Pluto ♂, Persephone♀). They had 8 sites: not in use 4 (3dens); 4 in use (4 dens).

  Group K in 2003: the same adult pair had a single cub (Solo ♂), 3 subadults (another of '02 cubs disappeared). The adult pair ejected the two rehabilitated otters from last year at the start of the rainy season (both disappeared). The adult pair accepted another rehabilitated subadult otter (Rewa ♂) that participated fully in group activities. They had 8 sites (including 2 new ones, 1 collapsed): not in use 4 (4 dens); 4 in use (4 dens).
- *Top Group.* A group of otters also resides even further upstream from Group K. Their lowest site was found in October 2002. It is a large, perennial communal campsite with two dens (one now collapsed) and

sheer banks. The communal campsite is at the top of the bank but single scats were also found on the large protruding roots of a tree in the bank itself. Another campsite with a den on the opposite bank collapsed and was not used in 2003. We did not locate this group's other sites further upstream due to low water.

- *Group S*. We also surveyed the portion of the river downstream on the ranch to and including Simuni Creek and nearby oxbow lakes/ponds: Buffalo Pond, Moura Pond and Riverburst. While these areas are excellent potential otter areas we found no fresh traces of otters on Simuni Creek in March 2002, even though there were 7 abandoned campsites and it appeared as if the otters were no longer using the old sites on the creek. As the ponds on the creek are prime fishing areas used by commercial net fishermen the otters may have been disturbed. In October 2002, we saw a pair in Simuni Creek, and again soon after together with a subadult ♂, in Riverbust, near the entrance of Simuni Creek. The sites in and around Simuni sites were visited by the otters again in October 2002: 7 sites: 1 old (1 den), 6 in use (4 dens).
- *Group S2*. On the upper portions of Simuni Creek, at least 20 km upstream from the entrance of the creek and Group S, in low swamp forest, there is another resident group which was heard but not seen. There were 4 sites: 1 old, 3 in use (1 den). As we saw the S Group that day far downstream we knew this was a different group.

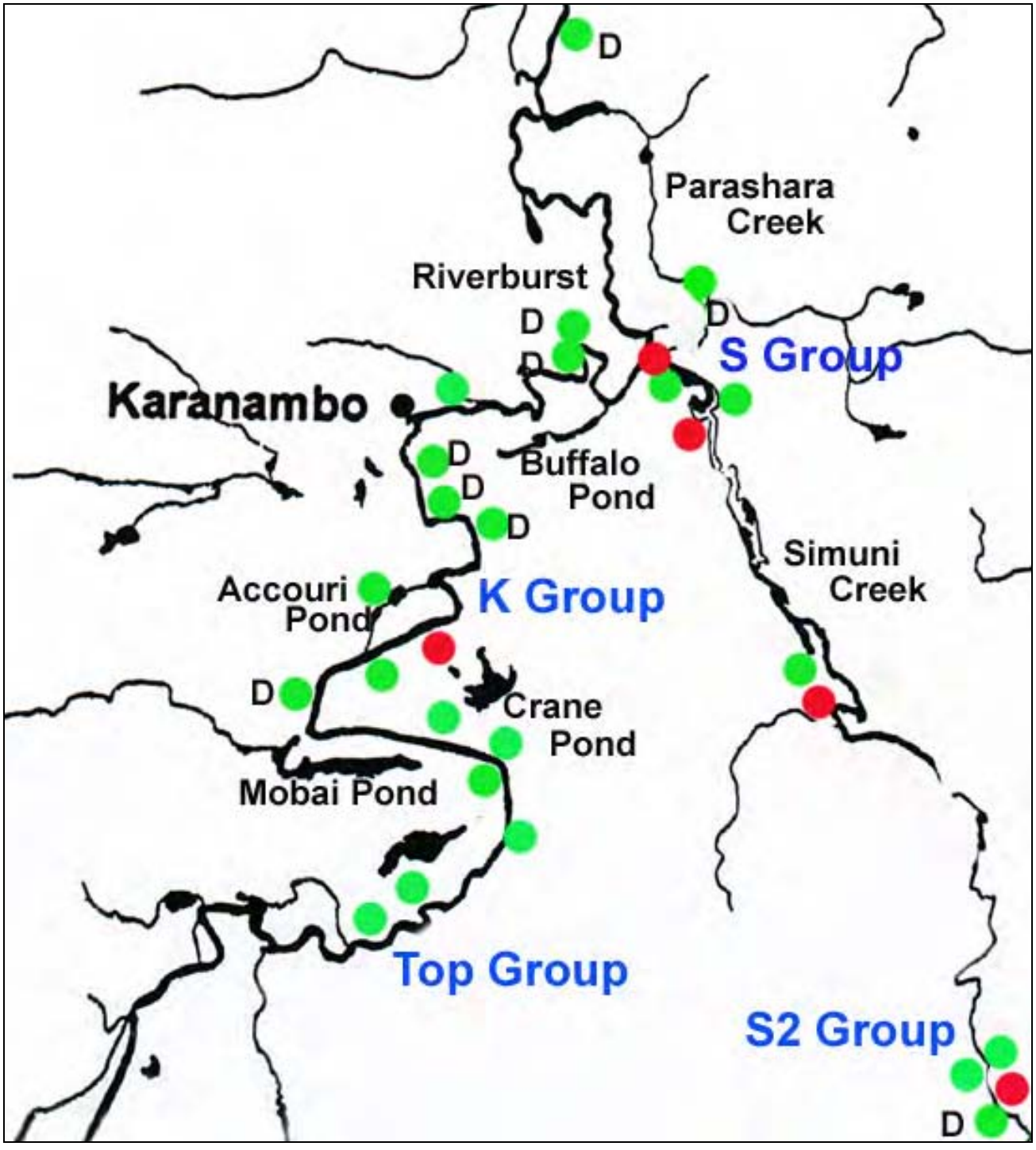
C. Conclusions

There is high overall biodiversity in the Kanuku region around Karanambbo Ranch with its unusual diversity of lowland and highland areas, but there is low habitat heterogeneity along this portion of the Upper Rupununi River except for Simuni Creek. Presence of threatened species: Giant otter, Black caiman, Giant River turtle and *Arapaima* in reasonable numbers. The Karanambo area offers ideal otter research conditions. The availability of a habituated resident group that can be observed closely on a daily basis provides the opportunity for close behavioral observation which is usually available only after long months or years of habituation. Here the adults and the cubs, both wild and rehabilitated, can be approached to within 1m and the behavior of even the smaller cubs can be observed – a unique opportunity to further our knowledge of Giant otters.

Sites of four groups of Giant Otters on the Upper Rupununi River near Karanambo Ranch, Guyana

Composite of three visits: March and November 2002, March 2003

KEY: = campsite in use = campsite not in use **D** = den



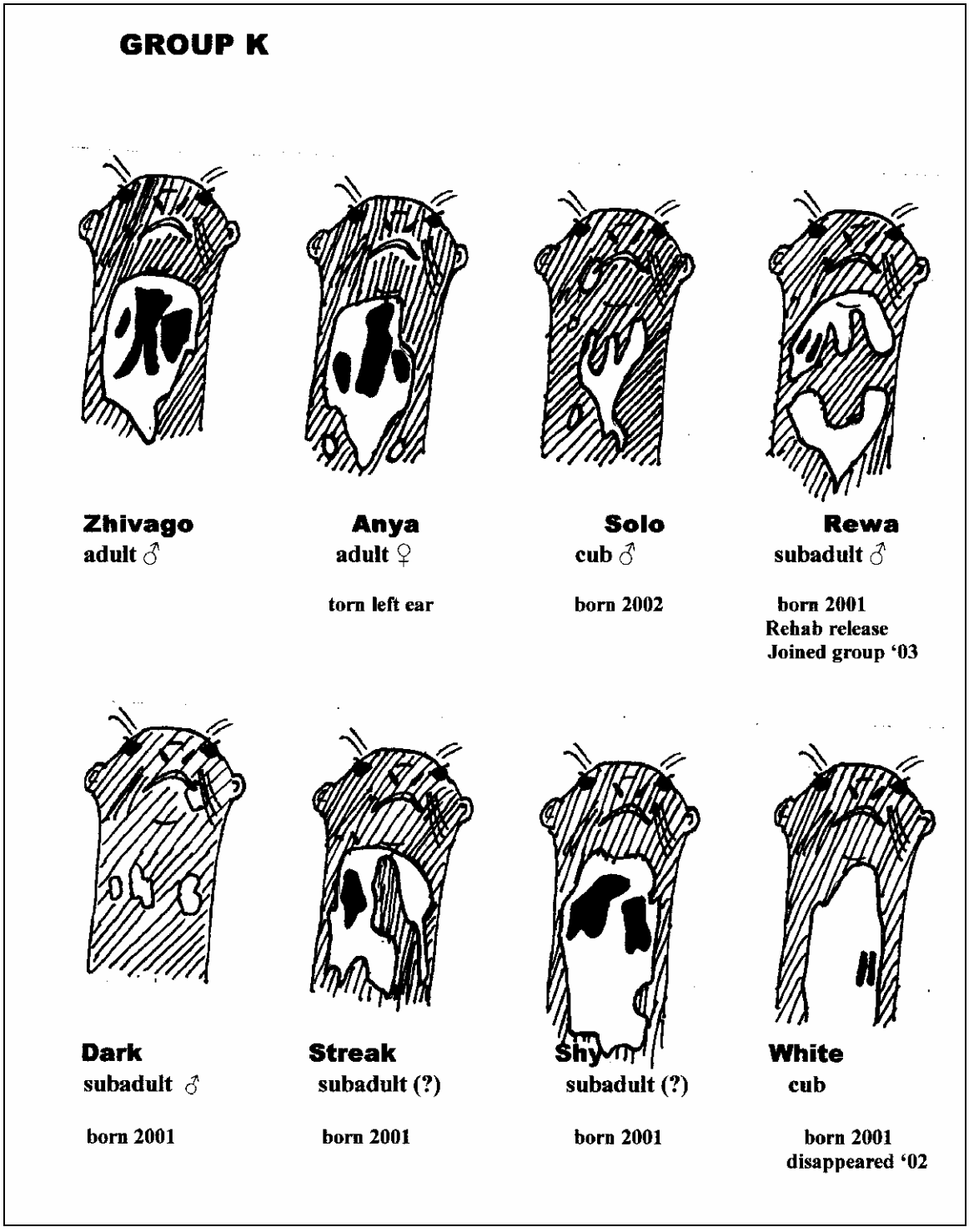
GIANT OTTER SITES at KARANAMBO RANCH, UPPER RUPUNUNI RIVER, GUYANA

June & October 2002, March 2003

SITE	TAG #	LOCATION	bank side	NOT IN USE	IN USE Oct '02	IN USE Mar '03	scratch wall	tracks	den	nr. lake, creek	otters seen	NOTE
Upper Rupununi River												
Group K 7 otters: 1 adult pair, 4 subadults (including 1 male rehabilitated), 1 juvenile												
RUP1D	1	N 03.45.04.3 W59.17.57.4	L	✔		new			✔			rest spot under roots
KAUR1D	81	N 03.44.36.9 W59.18.28.4	R	✔	✔	gone	✔	✔	✔			in use in Oct., collapsed
KAUR2D	4	N 03.43.47.3 W59.18.12.5	R		✔	✔	✔	✔	✔		✔	den in use, smell
KAUR3D	79	N 03.43.31.4 W59.18.39.9	L		✔	✔	✔		✔			vertical wall den
KAUR3B	80	N 03.44.23.0 W59.18.19.2	R		✔	✔	✔	✔	✔			vertical wall den, smell
RUP2D	3	N 03.44.06.9 W59.18.06.7	L			new		✔	✔			on sand bank nr. water
KAUR3B	2	N 03.44.21.6 W59.18.18.3	R		✔	✔	✔	✔	✔	✔	✔	"safe" den, smell
KAUR6D	77	N 03.43.36.3 W59.18.26.2	R		✔	not in use			✔			birthing den
KARST2	5	N 03.43.25.6 W59.18.46.4	R	✔		not in use	✔			✔		sand bank + path
KAUR7D	6	N 03.43.14.1 W59.19.02.4	R	✔		✔	✔		✔	✔		major site, old+new dens
Top Group Number of otters in group unknown												
KAUR5X	?	N 03.42.57.6 W59.18.38.3	L			new	✔	✔	✔			sand bank, nr. water
KAUR5D	78	N 03.42.57.1 W59.18.34.9	L	✔		gone	✔		✔			abandonned
Simuni Creek (not visited in March '03)												
Group S 4 otters: 1 adult pair, 1 subadult, 1 cub (true group size unknown)												
KASID1	90	N 03.45.29.4 W59.16.52.3	R		✔		✔	✔	✔			vertical wall den, smell
KASID2	89	N 03.45.29.4 W59.16.52.3	L	✔				✔	✔		**2, shy**	old latrine
KAS13	88	N 03.43.42.3 W59.15.59.9	R	✔				✔				old latrine
KAS14	87	N 03.43.36.7 W59.15.55.0	L	✔				✔				old latrine

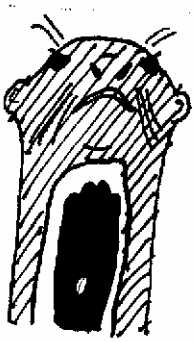
SITE	TAG #	LOCATION	bank side	NOT IN USE	IN USE Oct '02	IN USE Mar '03	scratch wall	tracks	den	nr. lake, creek	otters seen	NOTE
Riverburst, oxbow loop (**Group S** - see Simuni above)												
KARB1D	no	N 03.45.23.1 W59.17.28.1	L		✔		✔	✔	✔	✔	**2 (1.1)**	old den
KARB2D	no	N 03.45.20.1 W59.17.26.9	L		✔		✔	✔	✔			brand new birthing den
Upper Rupununi River, below Parashara Pond (**Group S** - see Simuni above)												
KAPBDN	no	N03.47.14.8 W59.17.44.7	R		✔			✔	✔	✔	**1**	transient otter, Group S?
Group S 2 Number of otters in group unknown												
KASI5	86	N 03.43.35.9 W59.15.54.5	R		✔			✔				latrine in use
KASID6	85	N 03.43.07.2 W59.15.49.8	L		✔			✔	✔			latrine in use
KASI7	84	N 03.43.00.2 W59.15.35.7	L	✔			✔					old latrine
KASI8	83	N 03.42.38.5 W59.15.06.5	R		✔		✔	✔				fresh latrine, smell

Throat patterns of Group K at Karanambo, Upper Rupununi River, Guyana (2002-2003)

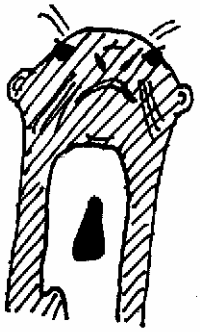


Throat patterns of Group S at Karanambo, Upper Rupununi River, Guyana (2002-2003)

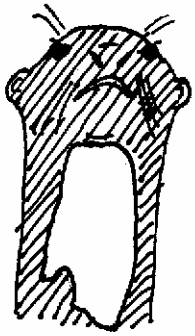
GROUP S (shy group)



Fingers
adult ♂?



Arrow
adult ♀?



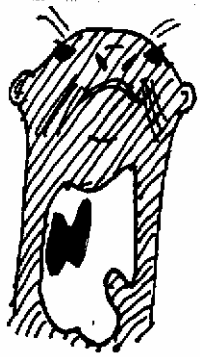
Parashara
subadult

born 2001

Riverburst
cub

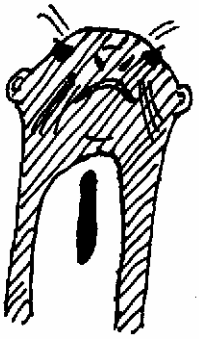
born 2002

Hand-reared rehab releases



Pluto
subadult ♂

born 2000
joined Group S '01
Disappeared '02



Persephone
subadult ♀

born 2000
joined Group S '01
Disappeared '02

Parawong
subadult ♂

born 2001

Disappeared '02

Mammals and birds observed at Karanambo and on the Upper Rupununi River, Guyana

Compiled by Dr Nicole Duplaix and the volunteers of the Oceanic Society
(please send additions or corrections to NDParis@aol.com)

NOTE: * denotes animals rarely seen or of special concern
KEY: T = tracks, N = nesting, ● = seen, ○ = heard

Mammals	**Karanambo, Guyana April 02**	**Karanambo, Guyana Oct 02**	**Karanambo, Guyana March 03**
Squirrel monkey	●		●
Capuchin	●	○	●
Howler monkey	○		
Bearded saki*	●	●	●
White-faced saki*	●		
Agouti	●		●
Capybara	●	●	●
Coati*			●
Giant otter	●	●	●
Neotropical river otter*	●		
Jaguarundi*			●
Jaguar*			○
Sac-winged bat	●	●	●
Fish-eating bat	●	●	●
Free-tailed bat			●
Myotis bat sp.			●
Giant anteater*	●	●	
Tapir*	●	T	
Birds			
Tinamidae			
Great tinamou		○	
Undulated tinamou		○	●
Red-legged tinamou			○
Podicipedidae			
Pied-billed grebe	●	●	
Phalacrocoracidae			
Neotropical cormorant	●	●	●
Anhingidae			
Anhinga	●	●	●
Ardeidae			
White-necked heron	●	●	●
Snowy egret	●	●	●
Cattle egret			●

Capped heron	●	●	●
Striated heron	●	●	●
Yellow-crowned night heron	●	●	●
Rufescent tiger heron	●	●	●
Blue heron			●
Chestnut-bellied heron	●	●	
Cochleariidae			
Boat-billed heron *		●	●
Ciconiidae			
Jabiru Stork*	●	●N	●
Wood stork	●	●	●
Threskiornithidae			
Green ibis *	●	●	●
Sharp-tailed ibis*		●	●
Roseate spoonbill*	●		●
Anaditae			
Muscovy duck*	●	●	●
White-faced whistling duck			●
Black-bellied whistling duck			●
Blue-winged teal			●
Orinoco goose*		●	
Cathartidae			
Black vulture	●	●	●
Turkey vulture	●	●	●
Yellow-headed vulture			●
Accipitridae			
Swallow-tailed kite *	●	●	●
Plumbeous kite	●	●	
Pearl kite*			●
Snail kite*			●
Roadside hawk		●	●
Gray hawk	●	●	●
Common black hawk			●
Great black hawk	●	●	●
Gray-headed hawk	●		
Black-collared hawk	●	●	●
Savannah hawk	●	●	●
Crane hawk	●	●	●
Zone-tailed hawk		●	
Ornate hawk-eagle*		●	
Pandionidae			
Osprey	●	●	●
Falconidae			
Laughing falcon	●	●	

Yellow-headed caracara	●	●	●
Crested caracara	●	●	●
Red-throated caracara	●	●	
Bat falcon	●	●	
Cracidae			
Little chachalaca	●	●	●
Marail guan	●		
Black curassow			●
Aramidae			
Limpkin*			●
Rallidae			
Purple gallinule*		●	
Gray-necked woodrail*			●
Eurypygidae			
Sunbittern *	●	●	●
Heliornithidae			
Sun grebe	●	●	
Jacanidae			
Wattled jacana	●	●	●
Charadriidae			
Pied lapwing	●	●	●
Southern lapwing	●	●	●
Scolopacidae			
Spotted sandpiper	●	●	
Solitary sandpiper			●
Burhinidae			
Double-stripped thick-knee		●	
Laridae			
Yellow-billed tern	●	●	●
Least tern			●
Rynchopidae			
Black skimmer	●	●	●
Columbidae			
Scaled pigeon	●	●	●
Pale-vented pigeon	●	●	●
Ruddy pigeon	●	●	●
Gray-fronted dove			
White-tipped dove	●	●	●
Ruddy dove			●

Psittacidae			
Blue and Yellow macaw	●		
Scarlet macaw *	●		
Red and green macaw	●		
Brown-throated parakeet		●	●
Golden-winged parakeet	●	●	
Blue-headed parrot		●	●
Yellow-headed parrot	●	●	●
Orange winged parrot	●	●	●
Mealy parrot	●	●	●
Cuculidae			
Squirrel cuckoo		●	●
Greater ani		●	●
Smooth-billed ani		●	●
Strigidae			
Spectacled owl		○	○
Nyctibiidae			
Common potoo	●	○	
Caprimulgidae			
Pauraque			○
Nacundo nighthawk		●	●
Band-tailed nighthawk		●	●
Blackish nightjar			●
Least nightjar		●	●
Apodidae			
Fork-tailed palm swift	●	●	●
Trochilidae			
Rufous-breasted hermit			●
Reddish hermit	●	●	
Blue-tailed emerald		●	●
Black-throated mango		●	
Trogonidae			
White-tailed trogon	●	●	●
Violaceous trogon	●		
Alcedinidae			
Ringed kingfisher	●	●	●
Amazon kingfisher	●	●	●
Green kingfisher	●	●	●
Green and rufous kingfisher	●	●	●
Pygmy kingfisher	●	●	●
Galbulidae			
Green-tailed jacamar			●
Brown jacamar			○

Bucconidae			
Black nunbird	●	●	
Swallow-wing	●	●	●
Ramphastidae			
Black-necked aracari	●		
Green aracari	●		
Channel-billed toucan	●	●	
Red-billed toucan	●		
Picidae			
Ringed woodpecker			●
Yellow-throated		●	
Crimson-crested woodpecker	●		
Lineated woodpecker	●	●	●
Red-necked woodpecker	●		
Golden-collared woodpecker		●	
Dendrocolaptidae			
Straight-billed woodcreeper		●	○
Buff-throated woodcreeper		●	○
Furnariidae			
Pale Legged hornero		●	●
Formicariidae			
Black-crested antshrike		●	
Mouse-colored antshrike	●	●	
Cinereous antshrike	●	●	●
White-flanked antwren	●		●
White-fringed ant wren	●		
Black-chinned antbird	●		
Warbling antbird			○
White-bellied antbird		●	
Cotingidae			
Screaming piha	●	○	
Bare-necked fruitcow			●
Pipridae			
Golden-headed manakin	●		
Blue-backed manakin		●	
Blue-headed manakin	●		
Tyrannidae			
Tropical kingbird	●	●	●
Boat-billed flycatcher	●	●	●
Rusty-margined flycatcher	●	●	●
Fork-tailed flycatcher	●	●	●
Vermilion flycatcher		●	
Greater kiskadee	●	●	●

Lesser kiskadee			●
Cinnamon attila		●	
Common tody flycatcher	●		●
Mouse-colored tyrannulet		●	
Slender-footed tyrannulet			●
Drab water-tyrant			●
Rufous-tailed flatbill			●
Crested elaenia		●	
Yellow-headed elaenia			●
Hirundinidae			
White-winged swallow			●
White-banded swallow	●	●	●
Blue and white swallow	●		●
Bank swallow	●	●	●
Barn swallow			●
Gray-breasted martin		●	
Troglodytidae			
Coraya wren		●	
Buff-breasted wren	●	●	●
Musician wren *		●	

Gray-headed warbler		●	
Ovenbird	●	●	●
Thraupidae			
Red-legged honeycreeper			●
Blue-gray tanager	●	●	●
Palm tanager	●	●	●
Silver-beaked tanager	●	●	●
Burnished-buff tanager			
Hooded tanager		●	●
Fringillidae			
Blue-black grosbeak			●
Grayish saltator	●	●	
Yellow-green grosbeak			●
Chestnut-bellied seedeater			●
Blue-black grassquit			●
Red-capped cardinal	●	●	●
Plain-colored seedeater			●
Ruddy-breasted seedeater			●

F. Training and capacity building

Background: This project aimed to help the people of the Guianas better understand, protect and profit from their freshwater resources. The project coordinator trained local biologists, university students, indigenous communities and NGOs at the national and regional level. By training a few who, once motivated, can then train others, we hope that this conservation effort will have long-term effects.

In the past I had found that the local communities followed my research activities on their rivers with interest and pride. Indeed, upon returning to Kaburi Creek after a 25-year absence the Amerindians from Washabo greeted me as a long-lost relative and told me that they had not forgotten all I had 'done' for the 'their' Giant otters. I realized then that actively involving local people and students in this project might also influence their attitudes, and those of their children, towards the care and management of their natural resources on their rivers.

Student training. A final-year undergraduate student, or a graduate from a local university, or a local biologist was present on each trip. The researcher trained the student in river assessment methods and otter survey techniques. In Suriname, two biologists from STINASU, Claudine Sakimin and Marchal Lingaard were trained. Lingaard also provided local knowledge of the birds of the interior. In Guyana, a biologist with Iwokrama, Indranee Roopsind on the Bat Creek survey and is now conducting research on Giant otters at the University of Guyana for her Master's degree. An Iwokrama field ranger was also trained.

Local communities: On each trip two boatmen were hired from local communities (providing short-term employment), bringing the total task force to at least four people per survey – 15 boatmen were trained during the project. If the river was inhabited, the local community was visited and the Captain briefed on the intent and/or findings of the survey. Each community along the river is viewed as a vital partner in the project. Community leaders were interviewed to learn of any local concerns or human impacts: changes in fishing levels, pollution problems including gold mining in the area, socio-economic needs or plans, conflicts, and details on community activities.

Capacity building in the Guianas:

- ***Suriname:*** Marchal Lingaard, a STINASU employee, has participated in our Giant otter research since 2000, first in Kaburi Creek and now in this regional initiative. As such he is the project partner and an invaluable asset to the project.
  Bart De Djin, STINASU Research Director, also visited Kaburi Creek with us to familiarize himself with our research.
- ***Guyana:*** Apart from the students listed above, 12 Oceanic Society volunteers were also trained in Giant otter field techniques at the Karanambo Ranch. This is an ongoing program with the Oceanic Society that will train 10-20 volunteers per year.

International collaboration and network building: Our regional research and conservation program relies on a close association with both local and international partners. A great deal of time and effort was devoted to networking during this project. Listed below are some of our closest collaborators:

- Suriname: STINASU, Paul Obouter (National Zoological Museum), CELOS (Mapping Division), WWF-Guianas, and Conservation International (CSNR) are involved in the planning and logistics of the project.
- Guyana: Iwokrema, Karanambu Trust, the Oceanic Society and the EPA are actively involved is developing a river assessment program in Guyana.
- French Guiana and France: Kwata and WWF-Guyane are the main partners. Dr Helene Jacques DVM is in charge of conducting the otter surveys in French Guiana.
- International collaboration and networking: the project coordinator has long-standing professional contacts with other giant otter specialists and students in South America and worldwide spanning nearly 30 years. These contacts are maintained by email and on site work visits.

G. Giant Otter behavior and ecology -- new findings and discussion

1. Observations of the Karanambo Group K, Upper Rupununi River, Guyana

Several interesting behavioral observations were made concerning the adults and cubs during our three visits to Karanambo Ranch in 2002 and 2003. These include:

Territorial Behavior

1. **Ledges near the den entrances and/or the flat access points by the waterside are usually marked** with scats and urine prior to the group leaving the den and swimming away (see photo). In Suriname, this behavior is seen on the large communal campsites above the dens, but here, due to the sheer banks, campsites are not cleared directly above the dens (see photos). Instead small, flat ledges near the den entrance or on the shoreline below are used (<2m in diameter). We could smell the rank and fishy odor of these fresh 'mini' campsites as we approached.

Social Behavior

2. **The group used 3 of their 4 dens in 5 days**, sometimes 2 dens on the same day (see photos). One den may be used for resting during the day, another for sleeping at night. All the otters appear to sleep or rest together in the same den once the cubs join the group .

3. The **otters enter the dens still wet with no pause to rub their coat dry first**. Since most dens here are excavated in sand, they may rub themselves dry or "drip-dry" inside the den. Rubbing the coat dry is observed both on logs and, as in Suriname, when resting on communal campsites.

4. **Grooming and allo-grooming activities take place immediately after feeding**, the group forming a tight cluster with both the cubs and subadults (see photos). "Daisy Chain" grooming (a new term) is observed when *more* than two Giant otters groom each another: one otter grooms another next to it that grooms the other next to it, etc. (see photos). The otter at the end of the row may be grooming itself. All the otters are usually grooming simultaneously. All the otters in a group of seven were grooming simultaneously (see photo - one is seen pausing briefly - even the juvenile male on the extreme left, is grooming its mother).

5. **Cubs remain close to group**. After a while the cubs may start playing in the water but remain within a few meters of the adults. Grooming takes place in the shallows, resting half-submerged on logs and not ashore on campsites as is

common in Suriname (this may be due to the lack of campsites and the sheer banks in Karanambo).

Parental and Juvenile Behavior

6. The **parents actively kept the 3-6 month old cubs away from human observers,** on the other side of the river 30-40 meters away, whereas subadults were allowed to come as close as they wanted, even into the boat. If the cubs swam on their own more than halfway across, an adult would quickly herd them back to the shallows on the other side

7. In 2002, Pluto, the **male sub-adult rehabilitated otter that had been accepted by Group K, was a very attentive "minder"** of the cubs, bringing them fish after he had fed, grooming them, herding them into the den, and generally being very "aware" of their needs. Persepone, the female sub-adult rehabilitated otter also accepted by Group K, was also attentive but noticeably less than Pluto. In 2003, Rewa, another male sub-adult rehabilitated otter, was also a very attentive "minder" of the cubs just like Pluto has been the year before. The adults accepted this and did not interfere or show alarm or aggression.

8. The **juveniles crowd around an adult eating a fish with loud food-begging calls** and twice snatched the fish from the adult forcibly. The other juveniles would then also try to tear it from the juvenile that would give warning screams and wave its tail up and down while turning its back to the others to keep them at bay. Satiated adults shared fish with juveniles but juveniles do not share with other juveniles except by force. This food-sharing behavior has not been reported in the wild before and may be due to the fact that these particular otters are fed by hand twice a day to encourage them to come closer to the tourist boat.

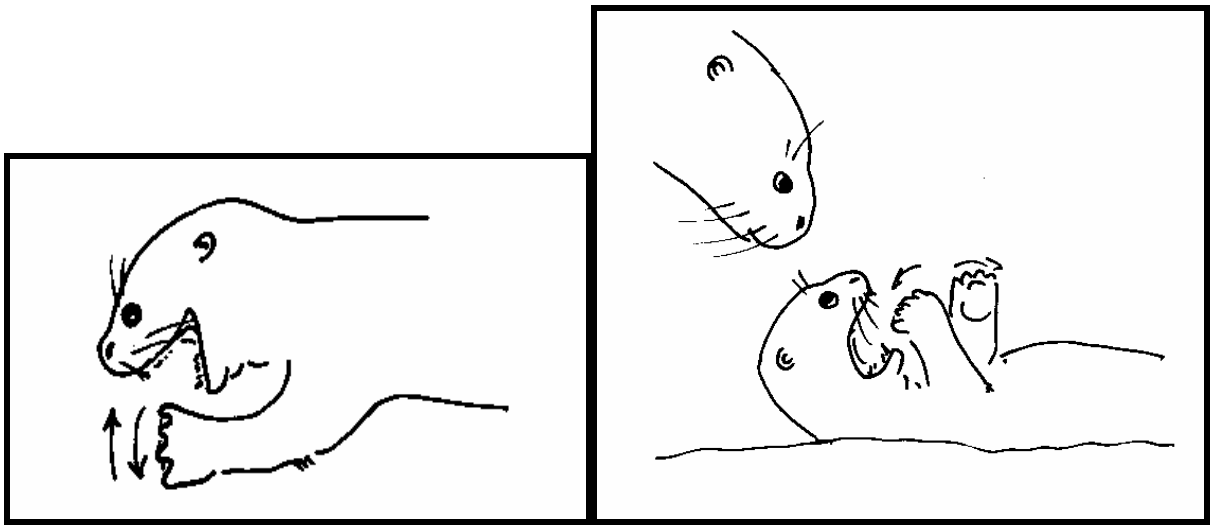
9. Pluto, a **male sub-adult, while protecting its fish gave a warning growl** and lunged at Zhivago, the dominant adult male, who snorted and moved away, making no effort to steal the fish. It was the first time I had seen a sub-adult lunge at an adult – in this case a rehabilitated male otter lunging at the dominant wild male.

10. **While swimming the juveniles stay close** behind the head of the adult, usually Anya the mother, either in a cluster formation or strung out in a V-line behind her (see photo). The mother makes re-assuring hum-coos just prior to swimming off and while swimming which appears to be a "herding" vocalization to both juveniles and subadults who follow her lead.

11. **One 4-month old juvenile, Shy, was twice separated from its group in March 2002** and once, apparently for several days (unless it was hiding in a den). On both occasions, the cub lingered outside the den in the shallows below when the group had retreated for the night and had not rejoined the group when we observed it the next day. This did not happen in 2003 when there was only one cub (Solo).

12. **A rehabilitated juvenile (Rewa ♂) that was beginning to stray further up an down the river,** before it was accepted by Group K, was seen swimming in the river at 22.00 hours, 4 hours after sunset when wild otters enter their dens for the night. This was highly unusual behavior as Giant otters are diurnal as a rule. There were large Black caiman in the vicinity that were active at night.

13. **Giant otter cub submissive panic posture**



Head and body pressed to ground **On back – looking up at subadult ♀**

Background: Two hand-reared male juveniles (Rewa ♂and Parawong ♂) at the Karanambo Ranch, aged 4-5 months, had been raised with an older subadult female (Persephone) that had been successfully re-introduced and now lived with wild Group K. Two months later, Persephone returned by herself after a fight with the group which resulted in a serious open wound to one forepaw. When she approached the juveniles they both elicited extreme alarm and submissive behavior. When an otter shows mild submissive behavior without alarm, usually the head is turned sideways, away from the aggressor (see table below).

Posture: The cubs, when approached by the sub-adult female, opened their mouths very wide, stretching it as wide open as possible, and waved their fanned forepaws on either side of their muzzles very rapidly up and down, parallel to but not touching the cheeks. The head was shaken from side to side rapidly. At first I thought they had something stuck in their throat that they were trying to remove. Both screamed continuously, a wavering intimidation scream. The sub-adult female did not show any agressive behavior, did not growl but gave a re-assuring chortles and coos – this did not stop the cubs' scream or frantic pawing up and down. (for detailed vocalization descriptions see Duplaix, PhD thesis, 1981)

Discussion: I've seen a similar posture in captive *L. lutra* and *Lontra longicaudis* in similar circumstances but only lying on the belly and screaming with mouth opened very wide, neck and body pressed against the ground, and without the frantic pawing (Duplaix, PhD thesis, 1981). Similar behavior has been reported when hand-reared subadults are released and approach a wild group that may or may not accept them. An attack by the group may follow, sometimes the 'intruder' is killed, or it is accepted into the group and remains with them (Diane McTurk, pers. com.).

I have been studying the wild Group K at the Karanambo Ranch in Guyana for two years and the adult pair has accepted hand-reared subadults in both years: 2001-2002 "Pluto" male, "Persephone" female and in 2002-3 "Rewa" male. The accepted hand-reared subadults participate fully in the group's activities, baby-sit the cubs and play with and groom other subadults and cubs and the adult pair in the group. In 2002, just before or during the rainy season the 'intruders', Pluto and Persephone, were evicted from the group and disappeared. The rainy season has just started in 2003 and I do not know what has happened to Rewa.

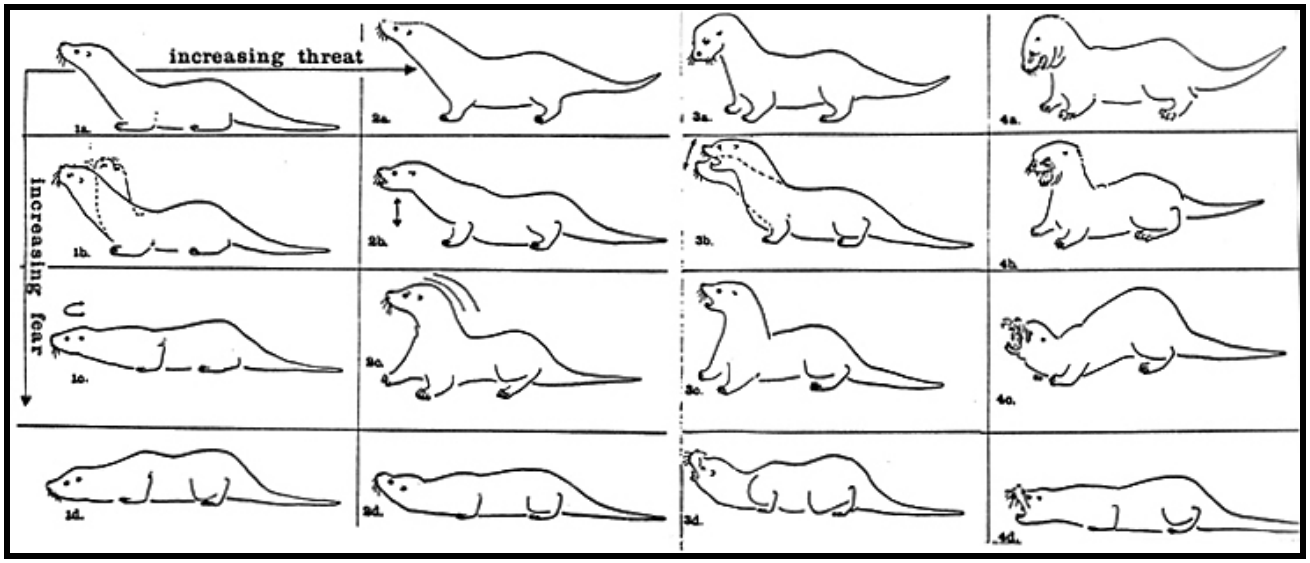


Fig. above. Increasing threat posture from left to right, increasing alarm from top to bottom. Bottom right hand corner is mouth wide open panic posture as seen in *Lutra/Lontra* otters which is similar to the Giant otter subadult behavior observed but does not have the rapid forepaw waving or head shaking. (illustration from Duplaix thesis, 1981)

2. New Findings on the Upper Coppename River, Suriname

Single scat marking behavior – revisited – on the Upper Coppename River, Suriname

Pteronura's usual form of marking its territory involves the use of communal latrines on campsites (Duplaix, 1980) as is common in the Guianas (see photos) and elsewhere in South America. During my first study of Giant otters in 1976-1978, I surveyed the Upper Coppename River and observed an unusual Giant otter marking behavior. On the Upper Coppename, in the falls/rapids areas (Hoof Falls, Tonken Falls, Sitdon Krutu Falls, and Langa Sula mainly) I found single *Pteronura* scats left prominently on boulders, large logs, sandbars, small islands and granite bedrock (Duplaix, 1980). At that time, I also found single scats elsewhere on Suriname rivers, but more rarely, in three other areas on fallen logs and boulders in the Zuid River (where boulders also predominate like on the Upper Coppename), the Tibiti River (where communal latrines are also common) and on Kabo and Kaburi creeks, both tributaries of the Corantyne River (scats found on logs once in each creek where communal latrines predominate). Single scats, therefore, are uncommon except in boulder-strewn falls areas of rivers where rapids occur during the dry season.

I was anxious to check on this single scat marking behavior again as it has only been seen since in Colombia (Groenendijk, pers.comm.) In Peru, where there have been long-term studies this single scat marking behavior has not been observed

On my two trips to the Upper Coppename in June and in September 2002 I was able to carefully study and document this single-scat marking behavior again. Here are some additional findings.

A site preference pattern is evident: again I observed that the majority of single scats were left: 1) on small sand patches at the foot of boulders or in between, 2) on top of smooth, rounded or flat boulders, or 3) on small sand patches (< 1m in diameter) by the water of uneven boulders with vegetation. In all cases the scat or scats are clearly visible from 20m or more and stand out from their surroundings – a whit-pink pile on top of a dark gray boulder. Once you are in an area where begin to find them you see them easily. Many of these sites are located within a radius of 2-20 meters of a small rapid and there may be several single scat areas near a single set of rapids. If there is another small rapid further upstream or downstream, single scats will again be present, whereas there will be none in between.

Another new observation: there are few large piles mixed-aged scats. On only a few boulders do you find both old and fresh scats, and most of these boulders are larger and closer to the rapids than the others where only dried scat heaps are found. These larger boulders have at least one sloping side which gives easy landing access to the otters. Perhaps the more distant boulders are marked as the water level falls and the river

channels change until only the ones near the deeper channels are still marked at the end of the dry season.

There seems to be a strong correlation between the choice of single scat sites and the proximity of these small rapids. On the slow flowing stretches of the river, there were few single scats (scats on 3 logs) and more 'typical' communal latrine campsites on the banks. So both marking methods may be used at the same time along the same river but not in the same habitat. During the rainy season (June 2002,) where almost all these boulders and islands are flooded, there were very few single scats on boulders and mostly communal latrines on the banks near creek entrances.

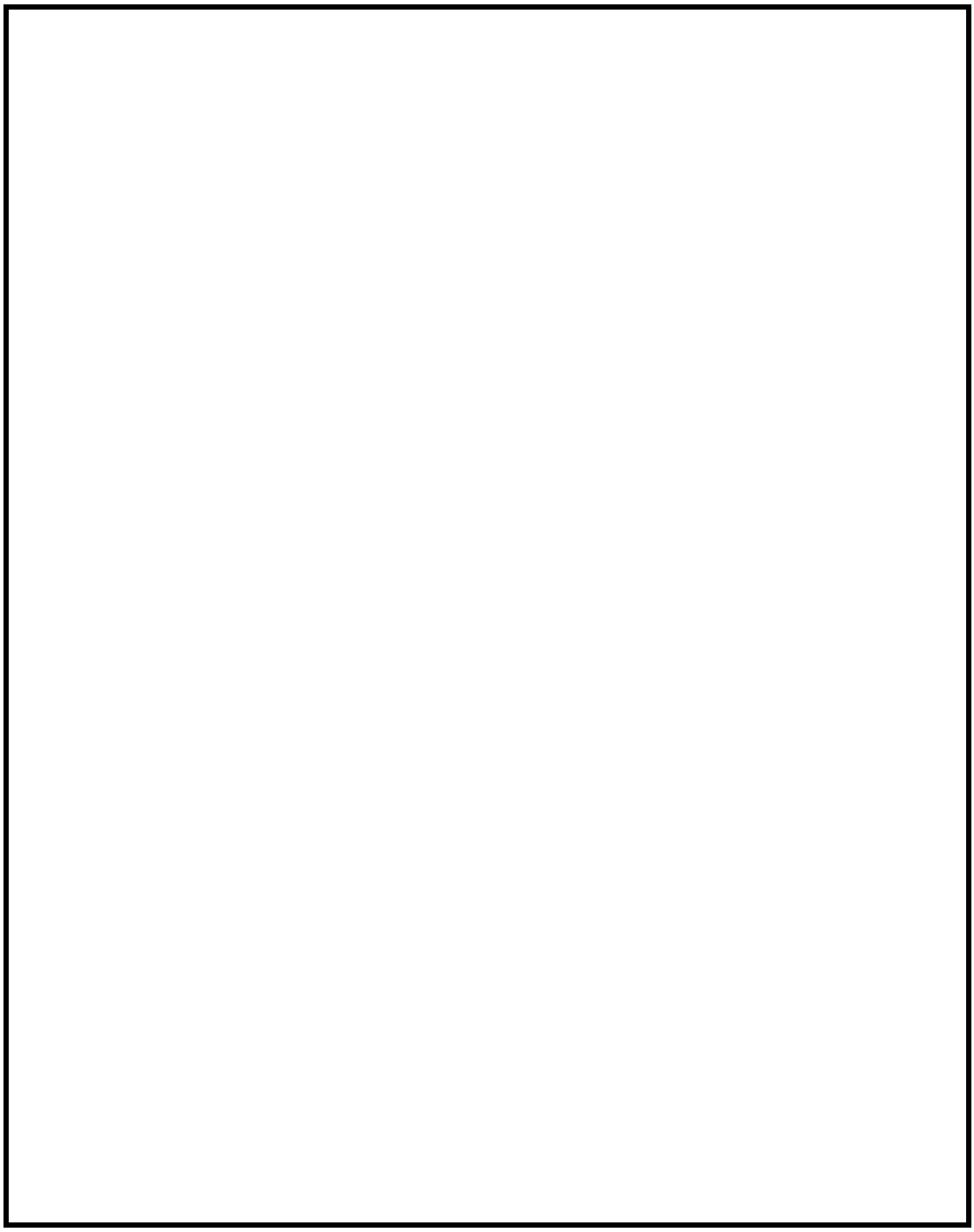
The single scats are usually not rubbed into the substrate*:* Giant otter scats are cigar-shaped in size (2.5 - 9 cm in length, 2-3cm in diameter, weighing 5-8g, see photos). Fresh scats are firm but dry out quickly on boulders heated by the sun and collapse into a mound of scales and/or crab remains (see photos). However, on two very large, flat boulders (one over 4m long) only fish scales remained and individual scats could not be seen (photos). Perhaps the large flat surface provoked the scat-spreading behavior because there was sufficient space to do so which the small boulder and sandy patches did not provide.

Neotropical otters and Giant otters on the Upper Coppename*:* both species exploit similar areas and sometime may leave scats on the same boulder (I had not observed this before). At Gran Sula and Tonken Falls, I found boulders with scats of both species (see photos). As the cigarette-shaped *Lontra* scat is much smaller (3-5 cm in length, 1- 1.2 cm in diameter or less, 2g) than the *Pteronura* scat, they cannot be mistaken one for the other when they are fresh or dry.

The smaller *Lontra* also eat and thoroughly chew smaller fish and crabs so that the hard remains in the scat itself are smaller and the scat is firmer. Further, the smell of the scat itself is different: *Pteronura* scat has a more fishy smell and *Lontra* scat has a muskier scent more typical of other mustelid scats such as ferret or marten (pers. obs.).

Although I have seen *Pteronura* and *Lontra* share smaller creeks, such as Kaburi Creek (both breed there), both species appear to focus on these boulder areas on the Upper Coppename during the dry season, probably because fish and crab are so easy to catch in the receding waters. Further, many of the smaller creek tributaries where *Lontra* lives year around are dry during the dry season, so that both species then are forced to use the best habitat available on the larger river in close proximity to one another. During the rainy season, *Pteronura* go up the smaller creeks into the flooded forest to find fishing areas in shallow water as the large river flows too fast and too deep (Duplaix, 1980).

Deposition of single scats appear related to seasonal water level, water flow, and bank type: On the Upper Coppename, that has both slow meandering stretches and white water stretches with boulders, both the communal latrine and single scat marking behaviors are present during the dry season, with single scats predominating in the boulder areas and small rocky islands with sandy patches.



In September 2002 the same single scat site patterns were found in Tonken Falls and Langa Sula, Upper Coppename River, as described in 1976 (figure from Duplaix, 1980). Boulders, sand bars and sometimes logs were used to deposit single scats across the breadth of the river, usually near small rapids.

Giant otter grooming and resting behavior (Suriname and Guyana) – New Findings #1

'Daisy chain grooming', a new term used to describe when more than two otters groom one another simultaneously. Karanambo, Guyana

'Daisy chain grooming' in a family group. All 7 otters are grooming one another, save one that has paused momentarily. Karanambo, Guyana.

Three subadults groom a cub simultaneously. One otter has its forepaw wrapped around the cub's head to keep it still (arrow). Karanambo, Guyana.

Otter 'autogrooming' its abdomen. Karanambo, Guyana.

Otters rest during the day, after feeding and /or grooming. Adult male resting in shallows in Kaburi Creek, Suriname.

Adult male resting on log. Karanambo, Guyana.

H. Conservation Discussion

Background. To identify Giant otter conservation problems and to make recommendations on how best to address them, we must first understand the adaptations as semi-aquatic carnivores that Giant otters make to live complex in complex tropical freshwater ecosystems. Unlike larger terrestrial carnivores, like the jaguar for instance, that have huge home ranges of 30,000 ha or more to hunt in (Rabinowitz, 1986), Giant otters exploit only a very small proportion of the habitat available. Otter home ranges are narrow bands of <200ha along the riverbanks of a river, creek or lake and the swamps or lakes nearby – this may represent a tiny portion of a small river in a huge reserve like the Central Suriname Nature Reserve (Duplaix, 1980, 1982). Therefore, anthropogenic impacts in that small home range, and particularly those affecting the river, will have a significant impact on the otters living there. Unlike the jaguar, Giant otters cannot and will not retreat to a 'safe zone' deep within the rainforest – the river is where they live.

In South America, and in other regions where roads are scarce, rivers are often the only means of access and transport for people. Communities build their villages on riverbanks and exploit both the forest and river resources. Giant otters and people have co-existed side by side for centuries and still do, as long as the villages remain small and the otters are not hunted. The reason the Guianas are often called "the last stronghold" of Giant otters is that hunting pressure from the pelt trade has been minimal unlike in the rest of South America.

We have seen the rivers like Kaburi Creek can sustain both good Giant otter densities and human use for decades with little change – until the level of human disturbance and/or destruction is such that the otters become shy and rarely visit overexploited portions of the rivers that used to be thriving otter territories.

Giant otter group dynamics. Another problem, recently studied in Peru, concerns Giant otter population dynamics (Schenk *et al.,* 2002.) We already established that Giant otters do not live in all portions of a river in a watershed (see above and Duplaix, 1980,1982). They require a certain type of lowland riverbank for their campsites and prefer to fish in shallow water. So only a proportion of each river is viewed as 'suitable habitat" by the otters living there and there may be long 'empty' areas in between.

Each group of Giant otters is made up of an adult pair, subadult offspring and juveniles or cubs. The offspring may stay with their parents for up to four years before they leave or are ousted forcibly by the adults. Only the adult pair reproduces each year, but not every year, and has 1-5 cubs as we observed in 2001 with the group of resident otters at Karanambo, Guyana. There is also significant cub mortality the first year: two juveniles died the first year in Karanambo, so that only 3 out of the 5 cubs survived to the next dry season. In 2002, the adult had one cub and in 2003, none. So population recruitment is slow with such small litter sizes and such high cub mortality.

When the subadults leave the group and are on their own, mortality is also a significant limiting factor, as they no longer have the 'security in numbers' of a group and ever-vigilant adults. These subadults, called 'transients', must find both an attractive *and* empty territory as well as a mate as they wander up and down the river. The odds do not appear to be in their favor unless there is a high otter population density present. While mortality data are unavailable for transients, many do not re-appear as adult pairs in such well-studied areas as Karanambo. So we must ask ourselves: Are Giant otter populations viable long-term in the Guianas where human pressures on the rivers are increasing?

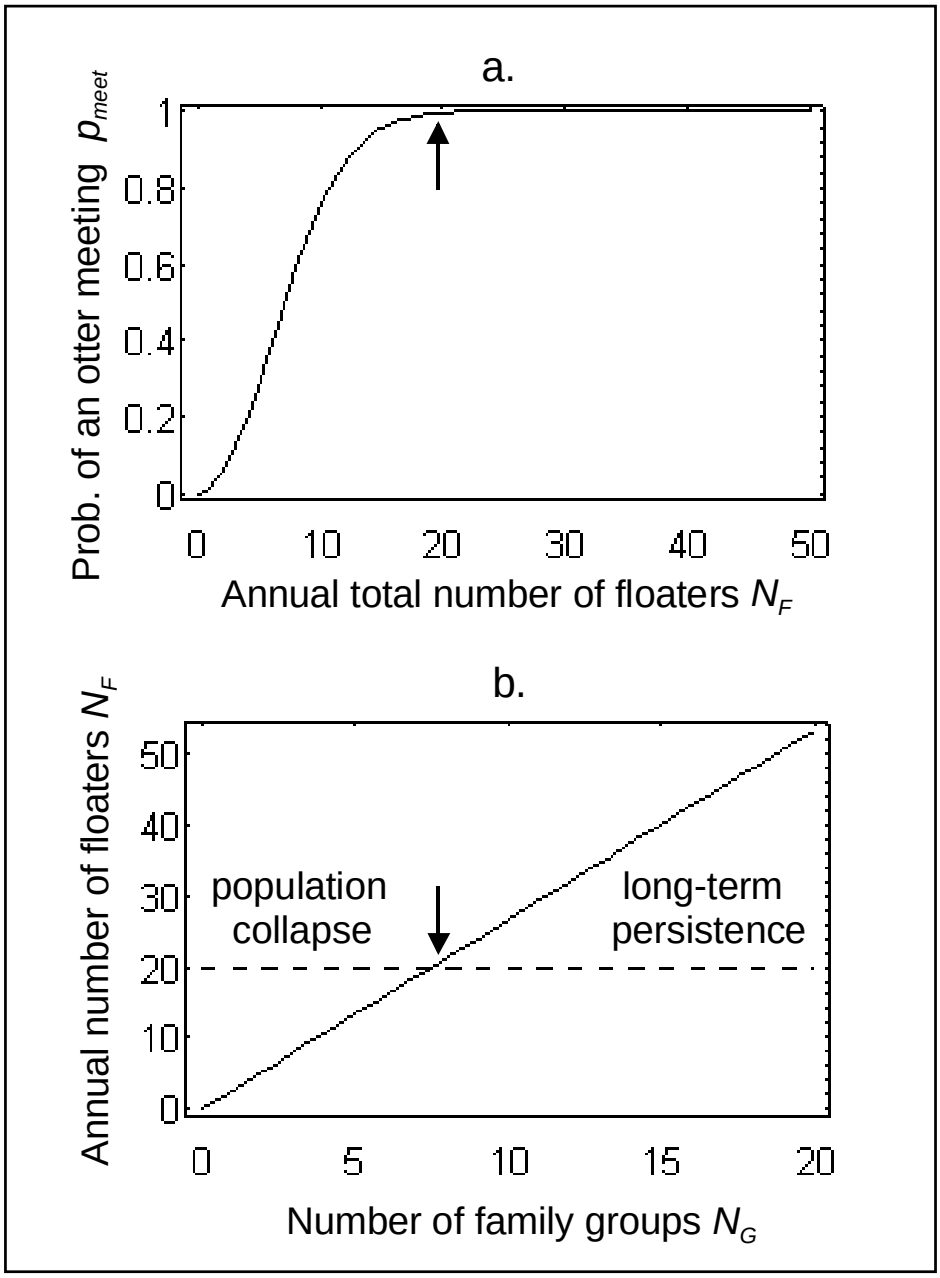
From our surveys, we can conclude that in watersheds like the Upper Coppename River in the CSNR and the upper reaches of the Rewa and Kitaro rivers, still pristine, isolated and largely undisturbed, Giant otters will continue to survive for many years. It is in the smaller rivers and creeks such as Kaburi Creek, Bat Creek and the Cusewijne River that the future is uncertain with human threats rapidly mounting and where Giant otter habitats are limited due the size of the rivers themselves.

Colonizing a vacant river or re-colonizing vacant portions of a disturbed river is not straightforward. Once Giant otters have abandoned a river (or, worse, a watershed) or been extirpated by hunters this creates a gap that must be found within a limited time frame by transient otters seeking territories. It is unlikely that such young, inexperienced animals, would find an adjacent empty river or watershed that would involve long and dangerous overland exploration. Their chances of exploring the river they know appear to be higher.

In Peru, Schenk and his colleagues, created a model to test the likelihood of a transient otter meeting a mate at the right time in the right place *and* finding an empty territory (see below and Schenk *et al.*, 2002). First, there must be a reasonable number of transients in a given river looking for mates each year. Second, each group must have a minimum number of cubs surviving in order to have a minimum number of transients available. High cub mortality, due to predation, disease or collecting by humans, will have a direct effect the number of transients that will set out on their own (see photos).

This 'colonization potential' by transients is clearly the vital key to the longterm viability or collapse of a Giant otter population on any given river in the Guianas just as it is in Peru. If the population numbers are high enough to withstand accidental loss of cubs or transients all is well and the resident population may even expand. The more resident otter groups breeding each year = the more subadults must leave their groups. The more transients on the river each year looking for a mate, the higher the probability of success and the quicker a territory is created or re-occupied. If, through attrition, pollution or accidental loss, the otter population number falls below a certain critical level or, if the population becomes too isolated geographically from the next nearest group of resident otters the transients will not be able to reach it in time, the collapse of the population is inevitable because there is minimal likelihood that transients will meet or find mates.

Establishing the minimum number of transients needed each year to insure the longterm viability of the Giant otter population in a given watershed is difficult to determine



This model shows that the number of Giant otter family groups present (bottom) and the number of dispersing, sexually mature sub-adult 'floaters' or transients (top) are the two most critical factors for the long-term persistence of Giant otters in Manu National Park, Peru – a park larger than the Central Suriname Nature Reserve. *Schenck et al., 2002*

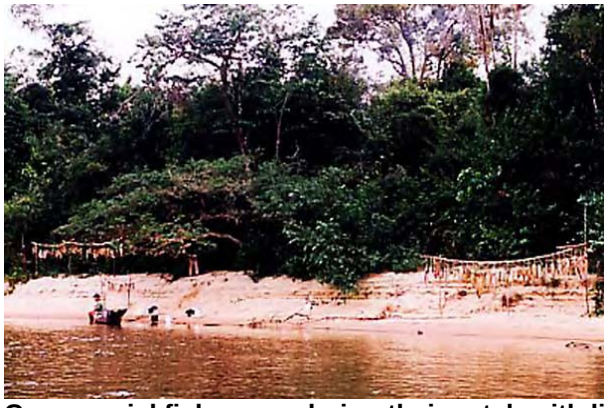
as it probably varies with the type of river system and how many potentially attractive empty territories are available and how far they are apart from each other. The most important factor in ensuring survivability is *preventing* increased Giant otter mortality due to anthropogenic factors that may trigger the irreversible population collapse of this endangered species in one river system after the other.

Human threats and mortality factors. Today the potential of such human-related increased mortality factors are visible on many rivers in the region and in many forms: the use of fishing nets (Corentyne, Kaburi, Upper Coppename, Cusewijne), gold mining (Cusewijne and on many rivers not yet surveyed), human-otter conflicts (Kaburi, Karanambo, Cusewijne) and tourism (Karanambo, Cusewijne, Kaburi). Further, as the populations of riverine settlements in the interior increase so do the resource exploitation levels, obviously. Inevitably, conflict will arise between people and otters competing for the same favored fish species. Add to that the 'outsider factor' as more urban hunters and fishermen travel to the interior for recreation. Add to that the 'ecotourism factor" as more and more people wish to see charismatic otters up close. Wildlife on rivers, be they manatees, otters, caiman, waterfowl, are easily disturbed by speed boats and outboard motors. And finally, and potentially the worst of all for both the people and the otters, the 'yellow metal factor" and the deadly mercury contamination that gold mining spawns far downstream.

Gold mining. Illegal gold mining has become common place in many remote rivers of the interior across the three Guianas. The mercury concentrations in the fish and people that have been sampled near gold mining areas in Guyana (Singh *et al.*, 1996) and in Suriname(Qwik & Ouboter, 2000) are higher than what is considered safe for humans, and also, therefore, for Giant otters. Similar unsafe levels have also been found in sampling studies in Peru (Gutleb *et al.*, 1997) and in French Guiana (Richard *et al.*, 2000.) Recently, the French army was sent to investigate the number of illegal Brazilian gold miners in southern French Guiana and they estimated that over 40,000 of them had now settled in a hitherto remote and inaccessible region (de Thoisy, pers. comm., 2003). I fear that the same is occurring in remote areas of the very isolated upper watersheds of rivers in the other Guianas

Such unsafe concentrations of mercury present in the water, fish and sediments pose serious threats to both humans and the wildlife that depend on fish for their survival. Steps to stop such unsafe gold mining practices with mercury release in rivers and creeks in the rainforest *must cease* to protect both humans and wildlife.

Human threats to Giant otters and habitat (Suriname and Guyana) - Conservation #1



Commercial fishermen drying their catch with lines or nets on the Upper Rupununi River, Guyana. Commercial fishing has recently increased due to the demand by Brazilian miners in the area and amy pose a threat to the Giant otters.

Macushi Indians on the Upper Rupununi have wounded and killed Giant otters with bow and arrows (used for fishing). Giant otters are sometimes viewed as competitors for dwindling fish stocks.

Human campsite on a Giant otter campsite in the Cusewijne River Nature Reserve, Suriname. The heavy tourist traffic has scared away the Giant otters and most otter campsites there are now abandoned.

Dead Giant egret in the Cusewijne Nature Reserve, Suriname. Illegal hunting and net fishing occurs frequently as there is virtually no law enforcement.

Both Neotropical and Giant otter cubs are collected by indigenous people in Suriname and Guyana to keep as pet or to sell in town even though both species are protected.

Dead Neotropical otter run over by a car on a coastal road in French Guiana (photo, B de Thoisy). Giant otter road kills are rarely recorded as they prefer rainforest rivers in the interior.

I. Conclusions

This survey was far too short and superficial to evaluate all the threats to the river systems in the Guianas and to come up with meaningful action recommendations. The one action recommendation that I will make is that more river surveys need to be done soon and the rivers that have been surveyed so far must be visited at regular intervals to obtain meaningful data.

I will underline what this and other surveys have established: the three Guianas remain the *last* stronghold of Giant otters in South America, with pristine Giant otter habitat on some rivers and good Giant otter densities overall – still, but for how long? The survival of the Giant otter populations in the Guianas is essential to the survival of this endangered species in South America.

These six rapid river bio-assessments surveys helped to better understand Giant otter population distribution, to recognize the species' habitat requirements, and to document the increasing level of anthropogenic that seem to be rapidly accelerating on certain rivers. As such these findings will contribute to a more effective Giant otter o e svnavers. As sit otter o eri1.0T

References and Bibliography

Barnett, A., Shapley, R., Lehman, S., Henry, E. & Benjamin, P. (2000). Records of the Giant Otter, *Pteronura brasiliensis*, from Guyana (Final version). *IUCN Otter Spec. Group Bull.* 17(2) 2000; pp. 65-74

Carter, S.K. & Rosas, F.C.W. (1997). Biology and conservation of the Giant Otter *Pteronura brasiliensis*. *Mammal Rev.* 1997, Vol. **27**, No.1, pp. 1-26

Chehebar, C. (1990). Action plan for Latin American otters. *In*, P. Foster-Turley, S. Macdonald and C. Mason (eds.). *Otters, an action plan for their conservation*, pp. 64-73. IUCN/SSC Otter Specialist Group, Gland, Switzerland.

Duplaix, N. (1980). Observations on the Ecology and Behaviour of the Giant River Otter (*Pteronura brasiliensis*) in Suriname. *Rev. Ecol. (Terre Vie),* vol. **34** (1980); pp. 496-620

Duplaix, N. (1982). *Contribution a l'Ecologie at a l'Ethologie de Pteronura brasiliensis (Carnivora, Lutrinae): Implications Evolutives*. Doctorat Thesis, U. of Paris-Sud, 352 pp.

Duplaix, N. (2001). Evaluation of the Animal and Plant Trade in the Guayana Shield Eco-region, Preliminary Findings. *World-Wildlife Fund and UNDP Guayana Forests & Environmental Conservation Project (WWF-GFECP) 2001*. 88pp. http://www.wwfguianas.org/Files/Guianas%20Trade.pdf

Duplaix, N. (2003). A Chorus of otters. *Whale, Journal of the Oceanic Society*. No. 8, 8-12.

Duplaix, N. (2003). Cub submissive panic posture and daisy chain grooming – a new descriptive term. *Giant Otter Bulletin No. 8 August 2003.* 4-6

Duplaix N., J.Groenendijk, C. Schenck, E.Staib & S. Sykes-Gatz (2001). Giant otter bibliography. *IUCN-SSC Giant Otter Specialist Group*. 224 titles. 17 pp.

Duplaix, N., M. Lingaard, & C. Sakimin (2001). A Survey of Kaburi Creek, West Suriname and its Conservation Implications, *Report to the Oceanic Society*, 34 pp

Gómez, J.R. & Jorgenson, J. (1999). An Overview to the Giant Otter – Fisherman Problem in the Orinoco Basin of Colombia. *IUCN Otter Spec. Group Bull.* 16(2)1999; pp. 90-96

Groenendijk, J. (1998). A Review of the Distribution and Conservation Status of the Giant Otter (*Pteronura brasiliensis*), with Special Emphasis on the Guayana Shield Region. Commissioned by the International Fund for Animal Welfare, produced by the Netherlands Committee for IUCN, March 1998; 55pp.

Gutleb, A.C., Schenck, C. & Staib, E. (1994). Giant Otter (*Pteronura brasiliensis*) at Risk? Total Mercury and Methylmercury Levels in Fish and Otter Scats, Peru. *Ambio* Vol. 26 No. 8, Dec. 1997; pp. 511 - 514

Gutleb, A.C., Schenck, C. & Staib, E. (1993). Total Mercury and Methylmercury Levels in Fish from the Department Madre de Dios, Peru. *IUCN Otter Spec. Group Bull.* **8**/1993; pp. 16-18.

Jacques, H., Pelsy, C., de Thoisy, B. (2000). La loutre géante en Guyane Française : *Rapport de mission sur le Litani*

Jacques, H., Pelsy, C (2001). La loutre géante en Guyane Française : *Rapport de mission sur l'Arataï*

Kruuk, H. (1995). *Wild otters - predation and populations*. Oxford Univ. Press; 290 pp.

Olson, D.M., Isola, S.E., Cogliano, M., Thieme, M.L. & Mobley, M. (2001). Designing a representative network of protected areas for giant otters (*Pteronura brasiliensis*) and other Neotropical freshwater megafauna. *WWF-US Report*. 17 pp.

Parker, T.A., R. Foster, L.H. Emmons, P. Freed, A.B. Forsyth, B. Hoffman, B.D. Gill (1993) A Biological Assessment of the Kanuku Mountain Region of Southwestern Guyana, *Rapid Assessment Program, Conservation International Report*. 70pp.

Quik, J.A. M.., P. Ouboter (2000). Water Quality Monitoring in the Commewijne Watershed, Suriname. *World-Wildlife Fund and UNDP Guayana Forests & Environmental Conservation Project (WWF-GFECP) 2000*. 88 pp

Rabinowitz, A.R. (1986) Ecology and behaviour of the jaguar (Panthera onca) in Belize, Central America. *Journal of Zoology* 210:149-159.

Richard, S., Arnoux, A., Cerdan, P., Reynouard, C., Horeau, V. (2000) Mercury levels of soils, sediments and fish in French Guyana, South America, Water, Air, and Soil Pollution 124: 221-244.

Schenck, C. and Staib, E. (1998). Status, habitat use and conservation of giant otters in Peru In: Dunstone, N., Gorman, M.,eds.: *Behaviour and Ecology of Riparian Mammals*, Cambridge University Press, 359-370.

Schenck, C., Staib, E., Groenendijk, J. & Hajek, F. (2001). Raising Awareness about, and Managing the Impact of Tourism in Giant Otter Habitats in South-eastern Peru. *The Wetlands Ambassador: Education and Public Awareness Methodologies for Otter Conservation*. Ando, M. & Sasaki, H. (eds.), Feb. 2001; pp. 44-46.

Schenck, C., Groenendijk, J., Hajek, F., Staib, E., & Frank, K. (2002) Linking Protected Are Conditions to Species Needs. In, *Landscape Ecology and Resource Management, Linking Theory with Practice*, eds. J.A. Bissonette & I. Storch. Island Press. Pp. 341-357.

Shackley, M. (1998). Designating a Protected Area at Karanambu Ranch, Rupununi Savannah, Guyana: Resource Management and Indigenous Communities. *Ambio* Vol. **27** No. **3**, May 1998; pp. 207-210

Singh, D., C. Watson, S. Mangal (1996) Identification of the Sources and Assessment of the Levels of Mercury Contamination in the Mazaruni Basin in Guyana, in order to Recommend Mitigation Measures. Institute of Applied Science and Technology report to the WWF-Guianas. 10 pages.

Staib, E. (1995). Social behavior and ecology of the giant otter (*Pteronura brasiliensis*) in Peru. In: Habitat Arbeitsberichte der Aktion Fischotterschutz e.V.. *Proceedings VI. International Otter Colloquium Pietermaritzburg 1993* (C. Reuther and D. Rowe-Rowe, eds.). GN-Gruppe Naturschutz GmbH: Hankensbuttel.

Staib, E. (submitted 2001). *Öko-Ethologie von Riesenottern (Pteronura brasiliensis) in Peru*, PhD dissertation, Munich University, Germany. (Currently being translated into Spanish).

Teunissen, P.A., D. Noordam, K. Boven, J. Nieuwendam & K. Janki (2001) Management Plan - Boven Cosewijne Nature Reserve (Suriname). *World-Wildlife Fund and UNDP Guayana Forests & Environmental Conservation Project (WWF-GFECP) 2001*. 100pp. + Appendices.