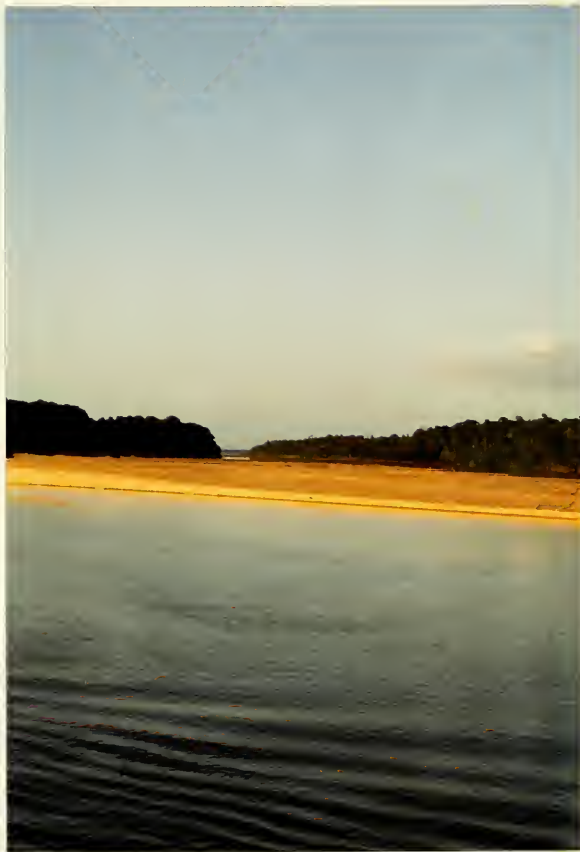


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A CENSUS OF THE FRESHWATER DOLPHINS
(*INIA geoffrensis* and *SOTALIA fluviatilis*) IN THE
RIO BRANCO WATERSHED OF GUYANA
AND BRAZIL
MICHAEL C. BOLAND



A sandbank on the Rio Branco

ABSTRACT

A census was done on the two species of freshwater dolphins found in South America, *Inia geoffrensis* and *Sotalia fluviatilis*. The area included the Rio Negro up to its confluence with the Rio Branco and the Rio Branco up to Boa Vista. These rivers are located in the Roraima district of Brazil. The Rupununi, Kuyuwini, Ireng, and Tacutu Rivers were also surveyed. The first two rivers are in central Guyana, while the second two form the western border of Guyana with Brazil. No dolphins of either species were sighted or reported in the interior of Guyana, though local reports confirmed the presence of *Inia* in the Ireng and Tacutu rivers during the flood season. There were 23 groups of *Inia* sighted during four full days and one half day of observation on the Negro and Branco rivers. 95.7% of these sightings were of a solitary animal. 22 groups of *Sotalia* were sighted, with groups of two or more accounting for 95.5% of the total. A majority (78.3%) of *Inia* were found 20 meters or closer to the river bank, while the opposite held true for *Sotalia*; with 77.3% of the sightings occurring 30 or more meters from the bank.

INTRODUCTION

The purpose of this research was to determine the range of *Inia geoffrensis* in the Guyana/Brazil area, and specifically to learn whether they are found outside of the Amazon Watershed in this area. The border between Brazil and Guyana also happens to be the division between the Amazon and Greater Essequibo watersheds. *Inia* is a freshwater dolphin found throughout a large range in South America (see Fig. 1), including almost the entire Amazon and Orinoco watersheds. *Inia* is found throughout the full length of the the Rio Negro and the Rio Branco, tributary and subtributary of the Amazon, respectively (Best and da Silva, 1993). The main route of travel where the majority of sightings were made is illustrated in Fig. 2. The primary goal was accomplished,

although direct observational data was not available for certain areas. There is widespread local observational data suggesting that *Inia* is found in the Guyana/Brazil border area surrounding Lethem, but only during the flood season.

There are two dolphins found in the area studied: *Inia geoffrensis*, (or the *boto* as it is called in Portuguese), and *Sotalia fluviatilis*. These animals are different in many ways, including their evolutionary history, morphology, ecology, and behavior. *Inia* is a member of the family Platanistoidea, and is more similar in morphology to some fossil cetaceans than most other living cetaceans. *Inia*, now strictly a freshwater animal, is believed to have ancestors from the marine world, although there is debate over from where and when it entered the Amazon Basin. The Amazon River flowed west before the Andes formed, and some authors believe that *Inia* entered from the Pacific 15 mya (Grabbert, 1983, as cited in Best and da Silva, 1993). Another theory is that the dolphins entered from the Atlantic only 1.8 to 5 mya (Brooke et al. 1981, Gaskin, 1982). *Inia geoffrensis* is placed in a family of its own, the Iniidae, with three other families in the superfamily Platanistoidea (Kaiya, Z., 1982). There is also disagreement over whether there is more than one species of *Inia* in South America. Pilleri and Gihl (1977, 1981) believe that there is evidence for the taxonomic separation of what is currently considered a subspecies of *Inia geoffrensis*. There are now three recognized subspecies: *Inia g. geoffrensis*, distributed in the Amazon drainage basin, other than the upper Madeira basin; *I. g. boliviensis* distributed in the Madeira basin above the Teotonio rapids; and *I. g. humboldtiana*, distributed in the Orinoco basin. If this question of the number of species is to be solved, the population in the upper tributaries of the Rio Branco would be an optimal place to start, as far as the first and the last species just mentioned. The population near the Casiquiare Canal would also have to be investigated. The distribution of *Inia* in the Guyana Shield area between Venezuela and Guyana is also unknown, and would help answer the species question as well (Meade and Koehnken, 1991).

Sotalia fluviatilis is a member of the Delphinidae family, a primarily marine group of cetaceans with only two other members that spend any considerable amount of time in fresh water. The number of species in the genus *Sotalia* is also a debated issue; currently seven subspecies are recognized. Some of the other questions concerning *Inia* are also an issue for *Sotalia*, such as the exact range of the species. This survey was organized to study *Inia geoffrensis*, but the data for *Sotalia* might be

useful for future researchers.

METHODS AND MATERIALS

This survey was conducted in January and February of 1994. At that time, the Rio Negro in north-western Brazil was in mid-flood stage, while all of the other rivers mentioned were at their peak low point. The Rio Negro, Rio Branco, Takatu River, and Ireng River are all tributaries of the Amazon, while the Rupununi and Kuyuini are part of the larger Essequibo watershed in Guyana (see Fig. 3). Other than the Rio Negro, all of these rivers are "white water" rivers; that is, they are muddy with silt and run-off. The Rio Negro is a "black water" river, with a tea color caused by the tannins from the surrounding vegetation, similar to the waterways of the New Jersey Pine Barrens. The method of travel for the rivers varied. During one part of the survey, I traveled on a 32 foot tugboat pushing two barges, each approximately 150 feet long. This boat was powered by a 1500 horsepower Scania Diesel and traveled at a constant speed of 7 to 9 knots. The exact distance covered while traveling each day is impossible to calculate due to varying flow rates of the rivers, affected by braided channels and the reduced flow rate near the abundant sand bars on the Rio Branco. The observation point of this vessel was from the bow of the forward barge. This took me from Manaus, Brazil, on the Rio Negro, to Caracarai, Brazil, on the Rio Branco (Fig. 1). The *cachoeira* (rapids or small waterfall) above Caracarai prevents boats, and probably dolphins, from passing, except at peak high water. This necessitated hiring a smaller boat from the town of Caracarai to travel to Boa Vista. I travelled in a 20 foot aluminum boat with a 60 horsepower outboard. This enabled me to travel the 70 miles between Caracarai and Boa Vista in one day. All of the other boats utilized were *corials*, or narrow dugout "canoes". The *corials* used for the Ireng and Takatu River survey had 30 and 15 horsepower motors, respectively; the others were paddled. The approximate areas where null sightings occurred are illustrated in Fig. 3.

A constant system of observation was maintained for all of the rivers surveyed, except for where otherwise noted. The system of observation was a constant daily visual survey of both river banks, from slightly before sunrise until 15 minutes after sunset. A pair of Nikon Travelite 7x20 binoculars were used for positive identification when needed. The information was recorded in a journal and any extended observations on a Sony tape recorder. Photographs were also taken, and examples of high

and low water accompany this report.

The data for sightings is given for each river traveled on, with information regarding: the number of animals sighted, the distance the animal was traveling from the boat, the distance the animal was traveling from the bank, the occurrence of any tributaries and their approximate size, the width of the river, the side of the boat the animals were sighted on, and any notations on the sighting. It should be noted that all of the distances given were estimates. The number of animals seen were as accurate as could be estimated by eye, but in some instances they were questionable. These instances are marked with an asterisk, and in all cases they are the lowest estimate. The distances were converted into an integral equivalent for ease of statistical comparison. That is, if an animal was estimated to be 10 meters from the bank, it was recorded in the statistical data as 1, an animal 20 meters from the bank was a 2, and so forth.

ANALYSIS

One of the major objectives of this survey was to determine the extent of the *Inia* population in the Guyana/Brazil/Venezuela area. When comparing the collected data to local information and previous publications on the distribution of *Inia*, there is strong evidence to support a rather long distance migration of *Inia*. No comparison can be made of the populations in the Rio Branco and the rivers bordering Guyana because of the lack of sightings, but a test can be made to determine the group size for both *Sotalia* and *Inia*. Out of 45 separate sightings, only four of them included an animal near a tributary, so that an analysis of whether animals were found more often near tributaries cannot be done (because of the small sample size). The distance the animals were traveling relative to the bank was also analyzed, and the results agree with previous publications on the behavior of both *Inia* and *Sotalia*.

RESULTS

Over 1000 kilometers were surveyed in Brazil and Guyana, including the null sightings. There were four full days of the survey, not including January 18, when the observation stopped upon arrival in Caracarai at 1435 and resumed the next morning at 0600. During those four days, 22 groups of *Sotalia* and 23 groups of *Inia*, including 54 and 24 individuals respectively, were sighted. These numbers were used to compute average

group size and average distance from the bank that the animals were observed.

Group Size: As previously mentioned, when there was confusion regarding the number of animals surfacing, which was not uncommon with *Sotalia*, the lesser number of individuals was given. The average group size of *Sotalia* was 2.45 with 95.5% of the groups containing two or more animals. *Inia* was found almost exclusively solitarily, with only one of the 23 groups definitely consisting of more than one animal. This accounted for an average very close to 1, at 1.04; 95.7% of the sightings were found to be of solitary animals.

Distance from Bank: There was also a dramatic difference found in the observed distance from the riverbank at which *Inia* and *Sotalia* were sighted. 78.3 % of *Inia geoffrensis* were sighted travelling within 20 meters of the bank, whereas 77.3% of *Sotalia* were sighted 30 or more meters from the bank. This agrees with behavioral accounts of both species (Magnusson, Best, and da Silva, 1980).

DISCUSSION

The null sightings made the statistical analysis difficult, but the amount of information collected should prove to be very helpful to any future research. Depending on how valuable one considers "local information", there is a strong possibility that the populations of both *Inia* and *Sotalia* migrate up the Rio Branco all the way to the Takatu River on the Guyana/Brazil border. This has been suggested by other authors, and while this study did not ascertain their presence, it did strongly point to the absence of *Inia* during the dry season. This could help confirm the idea that the animals are migrating out of the area during periods of low water. Previous studies have suggested that the migrations of *Inia* are of a local nature (Best and da Silva, 1989a), but this study has raised the possibility that *Inia* might migrate through several connected river systems during their migration, and possibly a distance of up to 500 miles. Again, there were many reliable eyewitness accounts and accurate descriptions (of both *Inia* and *Sotalia*) in the Lethem area, but these should be confirmed with direct observational data in April, May, June, July, and August. The question of *Inia* being found outside the Amazon watershed in the Guyana area has still not been fully answered, but initial indications show *Inia* only inhabiting the rivers that are part of the greater Rio Branco watershed, a subtributary of the Amazon. Therefore, it appears that there is no significant population of *Inia geoffrensis* in Guyana itself.

When local information is combined with the data from this report and others, we have a fairly clear picture of the movements of *Inia* in this area of Amazonia. However, this survey has highlighted one of the major problems with research in this area -- the extreme seasonality of the area, especially in regards to the megafauna.

Seasonality affects the distribution of both terrestrial and aquatic mammals. While surveying the Rupununi, I teamed up with Rob Sussman and Jane Philips-Conroy who were doing a baseline census of the eight primates found in Guyana. When they compared their results to the same census done in August of 1974, they realized that the fruiting of the riverine trees due to flooding must have given the previous census the large numbers of primates that they themselves did not see, (at least in the Apoteri area of Guyana). The local information that I collected is given as an appendix to this paper, and ranges from anecdotal accounts concerning the problems of going near rivers with *botos* in them while menstruating, to the optimal viewing time for *botos* at the confluence of the Rios Negro and Branco. The information is presented in conversational form, as it was recorded, and is often a translation of broken Portuguese.

It seems that the population of *Inia geoffrensis* found in the Ireng and Tacutu rivers bordering Guyana and Brazil migrates from somewhere in the Rio Branco, below Caracarai and possibly from as far away as the Rio Negro. This would be an unprecedented migration for a member of the Platinistodea, although hardly rivaling the huge distance that other members of the Cetacea travel. If we regard the null sightings above the rapids near Caracarai as more than an anomaly, the animals migrate at least 200 miles up the Rio Branco and Rio Tacutu. The Cotingo and Surumu rivers, the northern tributaries of the Rio Branco, were not surveyed; however, it was reported by all local river travelers that dolphins were never seen that far up. The dolphins are probably prevented from breaching the cataracts above Caracarai unless the river is at full flood stage, and if the lack of sightings are correct, they must migrate back down before the river recedes too much. Goulding has documented the migration of fish in this pattern (Goulding, M., et. al., 1980), and it would not be strange to suggest that a marine mammal adapts a similar strategy. It is believed that *Inia* breaches rapids and waterfalls during high water at other locations, such as San Fernando de Atabapo on the Orinoco in Venezuela (Best and da Silva, 1989).

It has been suggested by several of the local fisherman and river dwellers that *Inia* migrates up to the Guyana/Brazil area to have their calves. The timing would be consistent with what other researchers have

found for the calving of *Inia* (Leatherwood and Reeves, 1983). It appears that most seasonal migrations are at least partially associated with the abundance of fish (Best and da Silva, 1989a), but what part the availability of prey plays in this migration is unknown; the possibility of this area as a calving grounds also needs further exploration.

The group sizes found for both *Sotalia* and *Inia* are similar to the findings of other researchers in this area. There has been very little work done on the ecology of either of these animals, so the comparisons are limited. Surveying almost 500 kilometers of the Rio Solimoes river in Brazil, three researchers from INPA in Manaus, Brazil found 81% of *Inia* traveling alone, and 55% of *Sotalia* in a group of two or more. This second figure was admitted in the study to be possibly lower than reality, because the number of groups of *Sotalia* with only one individual is "almost certainly an overestimate," as it is easy to mistake two dolphins surfacing separately for the same animal. (Magnusson, Best, and da Silva, 1980). Further complicating comparisons, the group size of both of these animals probably changes with the seasonal variations in water level and prey availability. This has been suggested in several other papers, and large numbers of both animals have been noted near the confluence of large tributaries during periods of low water (Kremer, R. 1989). The difference in observed group size is one factor that has led researchers to suggest that *Inia* is territorial. This was examined by Best and da Silva by calculating the randomness of the distribution of *Inia* in the Solimoes. If the distribution was random, the animals were probably not territorial, although there are, of course, other explanations for a non-random distribution, such as a non-random distribution of a principal prey species.

This is indeed what they found; but again, one must keep in mind the huge impact the seasonal difference has on the animals. While *Inia* might not be territorial during periods of low water, they might defend home ranges when the forests are flooded. Also, the size of the *Inia*'s range must also be kept in mind. It is only slightly smaller than the continental United States. Researchers in Peru believe that *Inia* is strongly territorial (Kremer, 1989), while Best and da Silva have found no strong indications of territoriality in the Negro and Tocantins rivers (Best and da Silva, 1989b). These are not contradictory findings considering that the populations are almost 1000 miles apart, separated by many watersheds. The possibility of this difference in behavior suggests that other aspects of the behavior of *Inia* might differ from one part of Amazonia to another, such as their migratory patterns.

One of the other more general observations made during the time spent on the Rio Branco was the traffic on the river. There were only 8 boats seen from the confluence of the Rio Negro and Rio Branco, to Caracarai. Five of these boats were small wooden vessels with outboards, and two were tugboats bringing back barges from Caracarai. There was also a patrol boat of the Brazilian "wildlife protection unit" that boarded our tug and made a search for two of the endangered Amazon river turtles that crawl onto the sandbanks during the low-water season to lay their eggs (*Podocnemis* spp.). They did not find the turtle and eggs that the crew had hidden. .

FUTURE RESEARCH

This project has shown that there is a strong possibility that the population of *Inia geoffrensis* migrates from at least below Caracarai to travel to the Tacutu and Ireng River along the border of Guyana. In several other papers presented by other researchers looking at the future of *Inia*, the plan for hydroelectric development that Brazil and the World Bank have for the Amazon is mentioned as one of the most serious threats (Best and da Silva 1989a). With the possibility that the population of *Inia* is highly migratory, at least in this area of its range, this threat becomes even more serious to the health of the population. Plan 2010 is a project that Brazil is ambitious to complete. It includes over 70 dams throughout the Amazon basin, including five in the greater Rio Branco watershed area (Gennino, 1990). The scale of the hydroelectric projects so far undertaken has proven to be unsuccessful. The three projects so far completed have also seriously altered the ecology of the riverine communities in a large surrounding area, preventing migrations of fauna, eliminating huge areas of once productive seasonally flooded forest, and occasionally poisoning the downstream fisheries due to the huge amount of decaying flora and fauna (Goldsmith and Hildyard, 1989). There would most likely be similar results of any large projects in the Rio Branco region.

There is a definite need for more research into the ecology of *Inia* in all areas of South America, but especially where these hydroelectric projects are proposed. It has been suggested that one of the benefits to any research done in such an area would be the ability to do before and after comparisons regarding population, behaviour, etc. (Best and da Silva, 1989a). It is my belief that these large hydroelectric projects should be put on hold until researchers have gained a more complete understanding of the workings of the ecosystems for which they are

planned. Hydroelectric projects the size proposed for most of the tributaries and subtributaries of the Amazon have the ability to isolate stocks of *Inia*, prevent migrations, seriously reduce prey populations possibly causing further negative interaction between *Inia* and fishermen, and in general degrade the watershed to a point where it could not support large predators such as *Inia*.

The distribution of *Inia* was one of the initial questions that this project intended to answer, and while the findings have suggested some answers, it has also raised some other questions. The exact range of *Inia* in the Guyana/Brazil/Venezuela area will have to be further examined, and while performing a census of the range the question regarding speciation could be examined as well. The optimal place to start would be the reaches of the Rio Negro, towards the Casiquiare Canal, an area that this census did not examine. The issue of the seasonality of the animals should play an important part in any future research, and the ultimate goal would be a year round research station following the behaviour of the animals through the seasons. If the dolphins do perform a long distance migration, this research station would have to be a boat; otherwise the use of some type of identification could be used to follow dolphins. The visual/photographic aids that are used on several large cetaceans would probably not be applicable to *Inia*. The dorsal hump that is seen does not appear to vary considerably between animals, more importantly, a larger drawback to a photographic or visual identification is the very short time that the animals break the surface. Perhaps several dolphins with very distinguishing marks could be visually identified, but the optimal method to track the movements of *Inia* would be to attach some type of transmitting tag. This could also help define how important the flooded forests are to *Inia* by recording exactly how much time they spend in them. We know that in some areas the animals do have a diurnal pattern in their movements into the flooded forest (Layne, 1958).

The exact route of the migration could be determined by examining the Brazilian section of the Tacutu that connects the Rio Branco to the Ireng and Tacutu rivers in Guyana. This would be the only possible route for the animals to take on their way to Guyana. The Surumu and Cotingo rivers should also be surveyed to determine absolutely that a population does not inhabit this area. The Brazilian Tacutu would have to be surveyed throughout March, April, May, June and July. This river should prove to be easily accessed, though the Surumu and Cotingo would be difficult to reach due to the lack of any roads to the area.

There is an excellent opportunity for researchers working on *Inia*

geoffrensis to team up with other researchers in the Amazon. While on the Rio Branco, even though there was a very limited amount of boat traffic, one of the boats carried a herpetologist working on the protection of the last nesting sites of the Amazon River turtles (*Podocnemis* spp.). I also met three North American scientists in Guyana: the primatologists mentioned earlier, and Peter Pritchard who was looking at setting up a conservation program in Guyana for the same turtles. Due to the difficulty in traveling along the rivers of the Amazon, a stronger network of researchers working there should be developed, particularly in conjunction with workers from INPA, the Center for Biodiversity in Guyana, and the Smithsonian's Biological Diversity of the Guianas Program, also based in Georgetown.

One other area of research that begs more attention is the question of mercury contamination in the rivers, and more specifically, if the mercury is bioaccumulating in animals like *Inia*. It appears that the last time researchers looked at *Inia* and mercury was 16 years ago (von Gewalt, 1978, as cited in Best and da Silva, 1993). There have been studies done on several fish species and the concentration of mercury was found to be high in fish that are part of *Inia's* diet, but whether the metal is accumulating in *Inia* remains to be investigated. The huge increase in gold mining (mercury is used as a precipitate in the search for riverine gold), particularly in the tributaries of the Rio Branco, would suggest the possibility of a parallel increase in the amount of mercury in the ecosystem. The huge open pit gold mines featured by the international media in the past several years are only the most dramatic in terms of news coverage. There are an equal if not greater number of miners working the rivers and streams in Roraima and adjoining Guyana (Forte and Benjamin, 1993). In many cases, they are using huge dredging systems placed on barges to travel up and down the rivers; in others, the *garimpeiros* (as the miners are known in Brazil) mine the tops of hills with the runoff, including mercury, heading downhill to the rivers (Guyana Chronicle, Dec. 12, 1994).

Interaction with humans has been, and still is, a major threat to most of the Cetacea, including the other members of Platinistodea; until recently *Inia* has not been seriously threatened by dolphin-human interactions. As can be expected, there is a long history of *Inia* -human relations; in fact the name *Inia* comes from the Guarayo Indians of north-eastern Bolivia (Leatherwood and Reeves, 1983). Many of the myths held by the *caboclos* (Brazilian Portuguese for "backcountry", usually river dwellers), were adapted from the myths of the indigenous peoples. They

have served the *Inia* well, for most of them include some description of the magical power of the animal, keeping it safe from the fisherman. This power carries through to the animals organs, so in many areas it is believed that the genitalia and eyeball are useful for "magic." This has been a popular theme in the environmental press, suggesting that the population is threatened due to demand for these organs (Sea Frontiers, 1993). This is fortunately inaccurate. The organs are used, but taken almost exclusively from animals already caught and killed in gillnets (Best and da Silva, 1993). The fact that they are caught in gillnets is a more serious problem, particularly because of the growing number of large commercial operations in the Amazon. There has been no assessment of the bycatch of *Inia* or *Sotalia* by the large number of fishing boats in the Amazon system, and this should be a priority for future research. As mentioned previously, even though some areas of the Amazon watershed appear largely uninhabited, their resources have often been seriously depleted.

The direct interaction between *Inia* and commercial fishing in the rivers suggests another threat to the *Inia* population: the large reduction of prey in some areas. Certain species of fish are completely gone from the Rio Branco, and industrious Brazilians are starting to enter the rivers of Guyana illegally to poach turtles and especially Arapaima, one of the largest freshwater fish in the world. The Arapaima, or *pirarucu* (*Arapaima gigas*), has been eliminated from many of the Amazon rivers, and it is not known what part it played in the *Inia* diet, let alone in the overall ecology of the rivers. Although *Inia* has a wide range of prey, 43 species of fish, it is not known if any one of these plays a more important part than the others in the nutrition of *Inia*. In the only study done on *Inia*'s diet, it was found that over 50% of the fish were fresh water croakers (*Plagioscion* spp.) (Best and da Silva, 1989). One of the major pressures on the fisheries of certain areas of the Amazon are the massive colonization projects creating large new demands for the fishery resources. This appears to be a continuing problem due to the *Calha Norte*, Brazil's plan to fortify its northern borders by promoting the colonization of them from the populous northeast. This is evident in satellite photos available from the Smithsonian Institute (pers. comm., Terry Hankel). The development in the Rio Branco region is particularly fast-paced due to the previously mentioned mineral wealth, but also due to the increased connection to Guyana (Forte and Benjamain, 1993)

The last major threat to the population of *Inia geoffrenis* in the area that was surveyed and the whole of the Amazon region is the amount and

type of deforestation occurring. One would not immediately connect the deforestation of the Amazon to the health of one of its river dwellers, but as has been pointed out, *Inia* is very much a part of the forest. Not only is *Inia* dependent on the large numbers of fish that disperse into the forest when it is flooded to feed on the dropping fruit of the trees; *Inia* itself is known to feed on fruit (Kremer, 1989). No research whatsoever has been done on areas of deforestation and their ability to still support *Inia*.

The fact that there appears to be a healthy population of *Inia* left in probably all of its historical range should not give ecologists or conservationists a secure feeling. Although there is presently no direct take of *Inia*, the myths that "protect" them decay rapidly in a society as drastically impoverished as parts of Brazil are. There has also been a serious reduction in other staple food items of the *caboclos*, such as the Amazonian manatee, river turtles, *Arapaima*, and many other species of fish. This kind of situation has forced people in other parts of the world to utilize otherwise off-limit animals. As has happened in the Gulf of Maine, reduced resources raise the ire of fishermen who then often blame their competing predators on the decline in the fishery, sometimes resulting in the persecution of those predators. Nevertheless, of all of the Platinistoidea, *Inia geoffrensis* currently has the healthiest population, and with continued and increased interest on the part of cetologists, our greater knowledge and understanding will hopefully strengthen their future.

APPENDIX 1

This is a brief account of the numerous descriptions of behavior, distribution, ecology, and mythology of *Inia geoffrensis* that was reported by various folks throughout Brazil and Guyana. The information was recorded usually by hand in my notes, but occasionally by tape recorder. The informant's name, "occupation", and relation to the study area is given previous to the information.

Gerry Hardy, naturalist/guide: Gerry is a Wapishana displaced from Guyana during the Marxist revolution of 1967. He now lives in Manaus, Brazil and leads tours up the Rio Negro.

"If you want to see the pink dolphins you should take a slow boat, you should just buy a boat. If you buy a new boat, I will take it off your hands

after you're through with it. Anyways, if you take a slow boat, you could follow those dolphins right up from the Anavilhanas (a highly braided section of the Rio Negro) to the Ireng . . . you won't find many dolphins now in the Mau (Wapishana for the Ireng). This is the earliest they would get there, but this year they probably won't make it till the end of February or March. If you were here in September you could have followed the boto up from the Negro and Branco meeting. That is where they gather during the low water season of the Rio Negro."

Domingo, ship's cook: Domingo was a wealth of information concerning everything about the Rio Negro and Rio Branco. He has spent 20 years going up and down the river on all kinds of boats. Our conversation was difficult because he did not speak a word of English.

"The river is at it's lowest so the dolphins will be easy to spot. We will see more dolphins on the Rio Branco then here on the Negro . . . You should just take a truck to Boa Vista from Caracarai because you will not see any dolphins above the cachoeira at this time of year, no matter how long you look."

Phyliss, student: Phyliss is a high school student in Lethem, Guyana who lives near the Tacutu River, the border between Brazil and Guyana. She is part Wapishana, as are many of the people in Lethem.

"I have not seen a dolphin in the river, but I still won't go near the river during my time." This was in response to a question regarding the superstitions surrounding botos posed to Phyliss and her brother. "If you go in the river, or even near the river when you are menstruating, the boto will come to get you." This belief is far from superstitious, as many species of dolphins in captivity have been known to become extremely agitated or aroused when a menstruating female is in the water. (Caldwell et. al., 1989).

Tony James, Wapishana: Tony lives on the Mau (Ireng) River thirty miles north of Lethem. He is a fisherman and has spent most of his 40 years on the rivers.

"You will find the pink dolphin here in the Mau, but only for a couple months. They come here to have their young, and then they go back down the river . . . You will only see one or two below Lethem because the water is too shallow for them in the Tacutu. They come from Brazil so the dolphins cannot go into the Rupununi because they do not speak English. So that when they transform themselves into men, the women cannot

understand their intentions." The myths surrounding *Inia geoffrensis* usually include this story of the animal changing into a young man and seducing women in riverside villages. It conveniently explains many pregnancies of women without husbands.

Louie Orella, Ranch Owner: The Rupununi district used to be a huge cattle ranching area, and Louie has spent many years travelling throughout the savannahs. He had just completed a journey down the Kuyuwini and up the Essequibo (a two month trip) at the age of 68.

"You won't see the pink dolphins here in Guyana, except for occasionally on the Ireng. I've seen the little one, the gray one, on the Ireng in a big group. Diane McTurk has seen the pink dolphin in February and March, but mostly when the rains come." (April, May, June and July)

Terry Hankel is mentioned as someone involved in communication over the settlements in the Roraima district. He is presently working for the Smithsonian's Biological Diversity of the Guianas Project.

POSTSCRIPT

The preparation for this senior project started in July of 1993. It included three months of Portuguese lessons with Wayne Snith in Ellsworth, (two hour sessions, twice a week). Many of the other pre-trip preparations were described in the initial Senior Project Proposal. I also pursued several grant options for the research that I proposed, and the International Rivers Network approved a \$700 grant. This report will be submitted to that group as well as several others.

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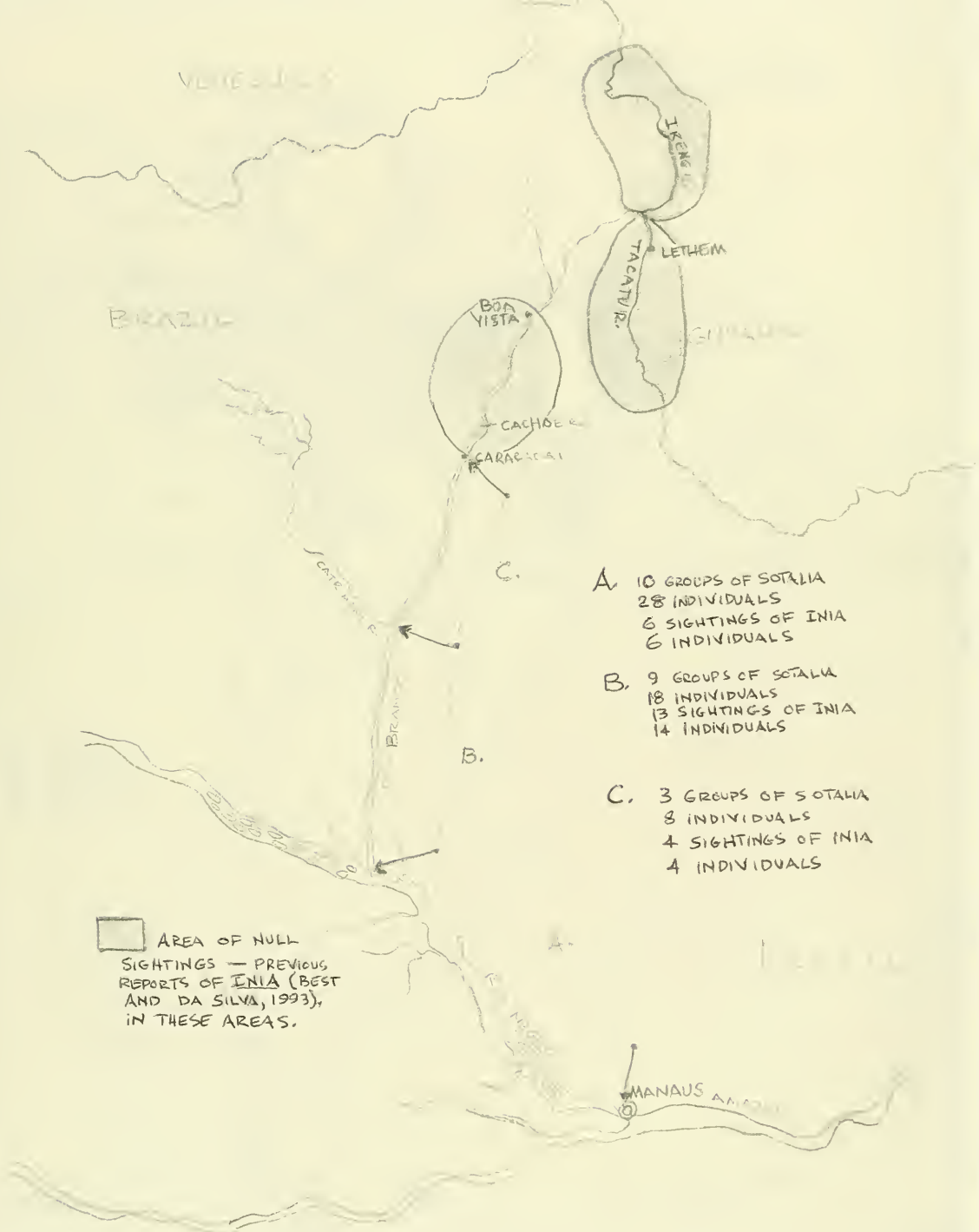


FIG. 2

DISTRIBUTION OF INIA GEOFFRENSIS



FIG. 1

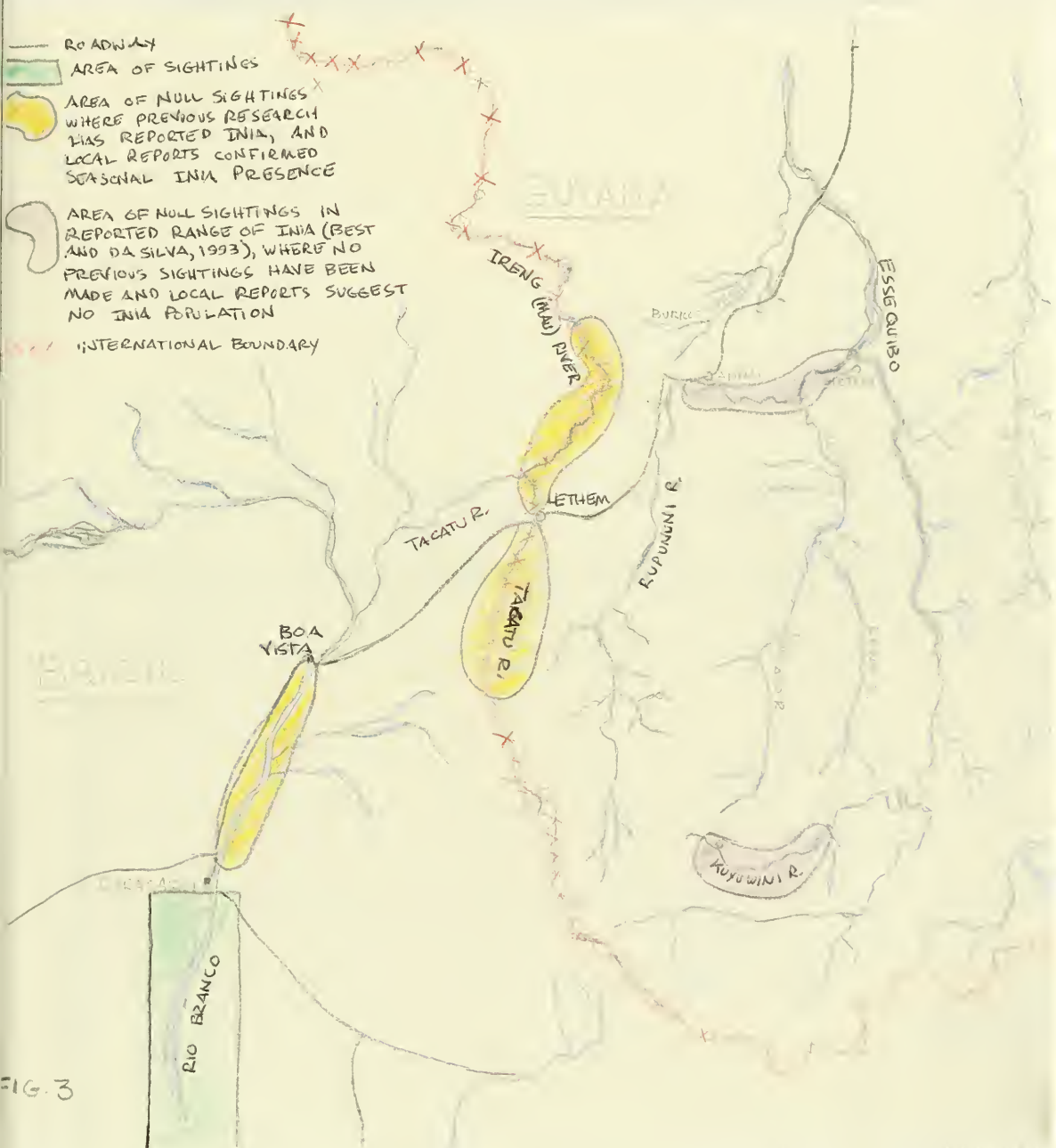


FIG. 3

A
0600 14
Time/Date
1 0605 14
2 0730 14
3 0740 14
4 1120 14
5 1730 14
6 1800 14
7 1815 14
8 1825 14
9 0815 15
10 0835 15
11 0735 15
12 0750 15
13 0755 15
14 0850 15
15 0855 15
16 0920 15
17 1130 15
18 1510 15
19 1705 15
20 1710 15
21 1825 15
22 1825 15
23 1835 15
24 1840 15
25 1842 15
26 0815 16
27 0830 16
28 0845 16
29 0845 16
30 0930 16
31 1040 16
32 1645 16
33 1710 16
34 1725 16
35 1745 16
36 1745 16
37 1750 16
38 1825 16
39 1835 16
40 0805 17
41 0825 17
42 0845 17
43 1105 17
44 1735 17
45 1805 17
46 0640 18
47 0655 18
48 1435 18
Null Sightings
Date
94/01/19
94/01/23
94/01/25
94/01/31
94/02/01
94/02/09
94/02/10
94/02/11

A	B	C	D	E	F	G	H	I
Time/Date	Species	Number Seen	M. from Boat	M. from Bank	Tributaries	River Width	Side of Boat	Direction Moving
0600 14	Began observations on the Rio Negro, 94/01/14							
1 0605 14			1	2	1 upS	5	Star	
2 0730 14	S	2	4	5	2 upM		port	up
3 0740 14	S	4	5	5		7	star	
4 1120 14	S	5*	2	2		4	star	
5 1730 14	S	4	2	2			port	
6 1800 14	S	2	3	2		5	port	up
7 1815 14	S	1	2	2		5	star	
8 1825 14	S	3*	5	3				
9 0615 15	S	1	5	1		6	star	
10 0635 15	S	2	6	2		5	star	up
11 0735 15	S	1	4	2		4	port	du
12 0750 15	S	1	3	1	1 upS	3	star	du
13 0755 15	S	3	4	3		3	port	up
14 0850 15	S	3	2	2		3	port	up
15 0855 15	S	1	2	2		3	port	du
16 0920 15	S	2	3	6		3	star	up
ENTERED THE RIO BRANCO								
17 1130 15			1	3		3		
18 1510 15	S	2	3	4		3	bow	
19 1705 15	S	2	3	2		3	port	up
20 1710 15	S	1	4	1		3	star	
21 1825 15	S	2*	3	3		3	port	up
22 1825 15	S	2*	3	2		3	port	
23 1835 15	S	1	4	2		3	port	du
24 1840 15	S	1	4	2		3	port	up
25 1842 15	S	2	3	3		3	port	du
26 0815 16	S	1	3	3		5	star	
27 0830 16	S	2	8	6		4	star	
28 0845 16	S	3	3	7		5	port	du
29 0845 16	S	2	3	7		5	port	
30 0930 16	S	2	9	2		3	star	du
31 1040 16	S	1	5	3		3	star	du
32 1645 16	S	1	9	2		2	star	up
33 1710 16	S	1	2	2		3	star	up
34 1725 16	S	2*	2	2		3	star	up
35 1745 16	S	2*	4	4		2	port	du
36 1745 16	S	1	4	1	15	2	port	
37 1750 16	S	2	2	2		2	port	
38 1825 16	S	3	3	3		3	port	up
39 1835 16	S	1	2	2		3	star	du
PASSED THE CATRIMANI R.								
40 0805 17								
41 0825 17	S	1	3	2		2	star	du
42 0845 17	S	3	6	3		2	port	
43 1105 17	S	1	3	3		2	star	up
44 1735 17	S	2	4	2	1 upM	2	port	
45 1805 17	S	2	4	3		2	port	
46 0640 18	S	1	3	1		3	star	up
47 0655 18	S	3	4	5		2	star	du
48 1435 18	ARRIVED IN CARACARAI							
Null Sightings								
Date	River	Time	Miles travelled					
94/07/19	Branco	0600-1600	60					
94/01/23	Takatu	0600-1900	25					
94/01/25	Ireng	0700-1830	45					
94/01/31	Kuyuwani	0545-1530	20					
94/02/01	Kuyuwani	0715-1930	20					
94/02/09	Rupunani	1030-2030	25					
94/02/10	Rupunani	0630-1945	25					
94/02/11	Rupunani	0700-1530	10					



Top: A view of one of the many sandbanks exposed during the low water season on the Rio Branco.

Bottom: Another look at the Rio Branco at peak low water stage; the top of the river bank can be seen above the roofline of the boat.



Both of these pictures illustrate the flooding of the forest, even though the Rio Negro is not yet in full flood. The dark brown color of the water is also visible, particularly in the top picture.



Top: A view from the wheelhouse of the tugboat that I traveled up the Rio Negro and Rio Branco on. The exposed bank of the Rio Branco can be seen.

Bottom: A typical *caboclo* transport on the Rio Negro. This boat would probably carry 4 to 5 men; sometimes a family would travel together. The flooding of the forest can be seen behind the boats; the river is approximately half of its full flood.

