

Lothar Staeck

Fascination Amazon River

Its People, Its Animals, Its Plants

 Springer

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Geographical overview of the fascinating world of the Amazon river from Nauta in Peru to the estuary

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Berlin, Germany

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1

Introduction: What Travellers Can Really See on Their Trip to the Rainforest

The largest river on earth has fascinated me since my student days. Since the late 1970s, I have visited the region between *Nauta* in Peru and the estuary west of *Belem* in Brazil again and again—at least 30 times to date. Initially, I also travelled to the Amazon region for scientific purposes. The main focus of my research interest at that time was the *cichlids*, a tropical fish family from the group of perch relatives (*Percomorphaceae*), which is characterized by an extremely interesting and highly developed courtship and breeding behavior. Of the approximately 3000 *cichlid species* worldwide to date, more than 500 have now been recorded in the Amazon and Rio Negro. Since the end of the 1980s, I have been leading natural history excursions into the vast landscape of the two river systems and have also been a tour guide and lecturer between *Nauta* and *Iquitos* (on the western edge of this river system) and *Belem* (about 120 river kilometres from the mouth of the Amazon into the Atlantic) on several occasions (see also the map on page II of this book).

On these journeys I had numerous encounters with a wide variety of animals as well as with members of different ethnic groups living on the banks of the rivers. My travels were also accompanied by a number of health risky adventures: there were bites from piranhas, caimans and tree snakes, attacks from swarms of bees and ant colonies, and a boat capsized on the Amazon. Fortunately, I survived all of it ultimately unscathed. To report about all this in detail would go beyond the scope of this work.

The motivation to write a summary volume on the fauna and flora of Amazonia, including the people living in this region, instead came from outside. Travel participants and listeners of my lectures have repeatedly asked for a summarizing presentation

- the fascinating flora and fauna,
- of the native peoples and the *Caboclos*, the descendants of original immigrants from Europe and these same native peoples, as well as ultimately,
- of the mighty Amazon River itself, with its enormous seasonal variations, its extremely diverse tributaries, and its general imposing characteristics

in demand. Unfortunately, this entire region is extremely endangered by constant slash and burn of the forests, by overexploitation, by illegal massive exploitation of mineral resources (e.g. gold), by the construction of huge dams, but also by the exponential growth of the human population in these sensitive ecosystems—for example, the population of Brazil has quadrupled from 1951 to 2018, from 51 million to now over 210 million. No one knows how much longer it will take until the river and its adjacent rainforests collapse. But one thing is certain: if the listed facts for the forest destruction and the river pollution and above all the exorbitant population increase do not stop by the time the next generation grows up, then in the next century there will be no more primary forests on the Amazon, and with them almost all wild animals will then also be extinct.

Perhaps the present volume will help to avert the great catastrophe that is looming in Amazonia.

I have been traveling in the Amazon lowlands for many, many years. Every time I came back, I thought on a newly started trip that I had now seen everything and there was nothing new for me to experience. But then on each subsequent trip I was surprised anew that—in addition to meeting foreign people—I kept encountering flowering plants and animals that I had never seen with my own eyes before. That's why every trip to the Amazon is full of surprises!

From the immense wealth of plant and animal species that are still far from being comprehensively identified, this book filters out, in characteristic photographs and exciting descriptions, those that visitors can actually see on a 3-week journey through the area. Each of the plant and animal examples selected in this volume has an astonishing, often unbelievable peculiarity—either in its special morphology or in its behaviours, which make you want to read or think further about the featured plant or animal.

In my research into the classification of certain plants and animals, I have discovered that there is currently a huge correction or reclassification of the long established *nomenclature*, the internationally binding scientific list of names of living things. New methods in the study of phylogeny and from molecular biology make it possible to analyse the genetic material—the genome—of a particular living being in detail. In the process, numerous new

relationships are currently being established and rearrangements as well as new species definitions are being made, which are also taken into account here.

However, the focus of this book is, as mentioned, on those plants and animals that the visitor can actually see during a flying visit. The large mammals such as the jaguar, the puma, the ocelot or the lowland tapir are therefore left unmentioned. One would first have to penetrate deep into the jungle and also live there for a longer time in order to have the chance to meet them at all. Nevertheless, the traveller will come across their traces more often, e.g. at markets where their skins are offered or tapir meat is on the menu, for example in *Iquitos*.

Dive now with me into the fascinating world of the Amazon from *Nauta* to the mouth (please see frontispiece).



2

The Amazon: The Largest River on Earth

The Amazon is a river of extremes. In this chapter, its statistical data are described in detail. The reader should keep in mind, however, that all these data are provisional or approximate, as the data situation for this huge area is still incomplete today. Furthermore, the course of the river is traced from its source via various tributaries to its mouth. In the course of the last 25 million years, the geological development of this river has undergone an incredible turnaround, which can still be seen in many places on its banks. In addition, a large number of the creatures found in the river today document this reversal from a marine bay to a freshwater river. Due to the seasonal fluctuations in the river level, the morphology of both sides of the river bank is constantly changing. Both on the so-called river cliff, the steep bank on the outer side of a river bend, and on the slip-off slope, the bank on the opposite inner side, new landscape forms and river courses have developed over the years (see also Sect. 2.4). In addition, typical habitats develop during the rainy season: the flood meadows (*Várzeas*) and the flood forests (*Igapós*). These and the dry high forest (*terra firme*) are home to specific fauna and flora. Finally, the Amazon river system includes rivers with completely different chemical compositions. Thus, there are white-water, black-water and clear-water rivers, which allow the existence of very different species of plants and animals.

The largest river on our planet, with its approximately 10,000 direct or indirect tributaries and adjacent rainforests with an original size of 7,500,000 km², constitutes the huge Amazon ecosystem directly on the equator. Figure 2.1 shows how extensive this area is: The Amazon basin including all rainforests can easily fit into the land area of the United States (without Alaska and Hawaii) with its approximately 8,000,000 km². There are certainly

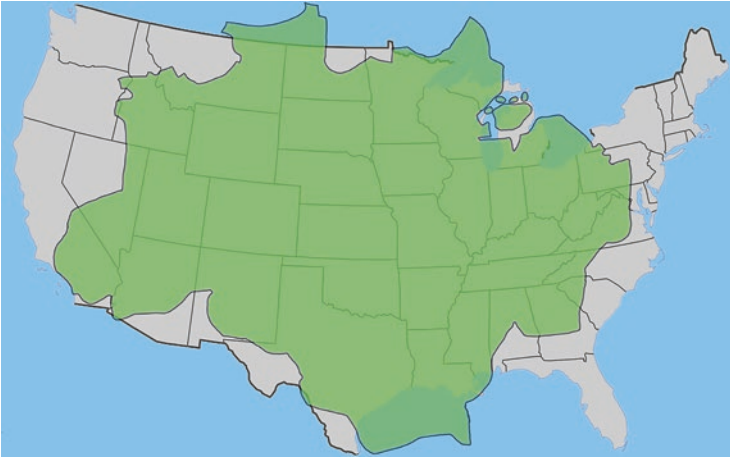


Fig. 2.1 Size comparison of Amazonia and the land area of the United States (without Alaska and Hawaii)—Amazon basin is marked in green colour

still many unknown animal and plant species in this vast area, which has still not been fully explored. To date, more than 5500 vertebrate species and more than 56,000 seed plant species have been described in Brazil alone (for comparison, in Germany: 530 vertebrate species and about 3500 seed plant species)—and every year numerous newly discovered animal and plant species are added. The Amazon basin is already ranked first in the world for plant, mammal, fish and insect species. Probably all the species of the Amazon lowlands will never be discovered.

Among the indigenous people, the Indians, even today every few years are discovered completely isolated groups living in the rainforest without contact with modern civilization. For example, newspapers recently reported that in the Brazilian Amazon, indigenous groups spotted from a helicopter shot at the explorers' small plane with bows and arrows. According to estimates by the Brazilian Agency for the Protection of Indigenous Peoples (FUNAI), there are over 100 isolated indigenous peoples living in the Amazon rainforest alone, whose language and way of life are completely unknown.

This is all possible despite our technologically advanced and connected world, because the Amazon rainforest is so incredibly vast and yet so difficult to access. In addition, the tropical climate is extremely hostile to humans.

2.1 The River Between Its Source and Mouth

Since GPS calculations by Brazilian scientists in 2012, the Amazon River, which flows continuously through the South American continent from west to east at the height of the equator, is considered the longest river in the world at 6868 km, thus displacing the Nile with its 6695 km in second place (see also Table 2.1).

The source was located in 1996 in the *McIntyre Lagoon*, 200 km west of Lake Titicaca high up at 5547 m on Mount *Nevado Mismi* in the Peruvian Andes, less than 200 km from the Pacific Ocean between the cities of *Cuzco* and *Arequipa*. From there, more and more streams and rivers join together to form a common drain that flows down from this massive mountain range. This watercourse at first, bears many different names, until at last the name Amazon is found on the map: *Lloquera* at first, then *Callamayo*, *Hornilles*, *Rio Ene*, *Apurímac*, *Rio Tambo*, *Ucayali* and *Marañon* near *Nauta* in Peru, where the *Ucayali* and the *Marañon* join at the small village of *Puerto Grau*, it is called Amazonas for the first time by the Spanish-speaking people (please see page II).

There are a number of interpretations of the name “Amazonas”. It is possible, for example, that it is derived from the *Tupi-Guarini* language term “*Amaçu*”, which means “sound of water” and refers to the tidal wave of the sea, which moves upstream from the Atlantic every year in a superposition of new moon and high tide effects from two tributaries of the Amazon. Even at high tide, the water depth at *Nauta* is often only about 6 m, so even smaller

Table 2.1 The Amazon in figures

Length ^a	6868 km (river kilometres)
Navigable	5215 km
Tributaries ^b	Approx. 10,000
Sediment transport	900 million T/year into the Atlantic Ocean
Current	0.75–5 m/s
Water volume ^c	
At high watermark	More than 300,000 m ³ /s
At low tide	About 100,000 m ³ /s
Gradient from the east end to the mouth	Total 180 m = 3 cm/km
Narrowest point (near Obidos)	1.5 km
Water depth	10–30 m, at Obidos deep holes of up to 120 m

^aNile: 6695 km, Rhine: 1320 km

^bOf which 15 are larger than the Rhine

^cIn the Rhine delta 2330 km/s (max. ever measured 12,000 km/s in 1926)

cruise ships rarely venture from *Iquitos* to *Nauta*. Yet this region is highly interesting, especially from a faunal point of view. For example, within the entire Amazon lowlands, some species of the spectacularly coloured poison dart frogs (tree climbing frogs) are only found in this region, from the upper reaches to the slopes of the eastern Andes (Sect. 9.1). The rare *Gray's bald-faced saki monkey* (*Pithecia irrorata*) is also common here.

But the Amazon did not always drain in a west-east direction to the Atlantic. Before the parts of the former primeval continent *Gondwana* drifted apart, the primeval Amazon originally flowed in exactly the opposite direction from east to west and flowed into the Pacific, because about 130 million years ago there were neither the Andes nor the Atlantic. At that time, the source of the proto-Amazon was in present-day Chad (Africa) in the *Ounianga Kébir* lakes of the *Ennedi Mountains* in the middle of the Sahara (Fig. 2.2). From its source to its mouth, this river was then the longest and most powerful river on Earth at 14,000 km. With the break-up and drifting apart of the parts of the primeval continent, the Atlantic Ocean was formed and in the west of the new South American continent—beginning about 25 million years ago—the Andes gradually folded up, cutting off the estuary of the primeval Amazon from the sea and leaving many animal species of the sea in the now dammed up huge inland lake. In the course of the following many millions of years the water of this inland lake sweetened more and more, numerous former animal



Fig. 2.2 Course of the primeval Amazon about 130 million years ago

species of the sea adapted to these changed living conditions and live in the Amazon until today, for example two dolphin species, sardines, herrings, needlefish (*Belonidae*), boxfishes, rays, shrimps and crabs in more than 30 different species, sponges and many other former inhabitants of the seas. The pressure of the water masses collecting in the inland lake finally became so strong that the water now drained eastward in the same glacial valley of the primeval Amazon and lastly emptied into the Atlantic Ocean. During the two ice ages in the course of the last 100,000 years, the level of the seas sank so much that the “new” Amazon plunged over gigantic waterfalls into the Atlantic at its mouth.

There is a great deal of geological and biological evidence for the existence of the primeval Amazon and thus for the river reversal, for example:

- Rock deposits from Africa in what is now the Amazon,
- The existing anomaly that the Amazon riverbed becomes narrower towards its mouth at *Belém* (and not wider, as is usually the case with large rivers),
- Finds of various fossils, for example identical species of diatoms and *mesosaurus* in the Amazon and in the desert of Chad,
- The only desert crocodiles still living today in the lakes of the *Ennedi Mountains* (Chad), genetically related to the Amazon caimans.

By the way: even today, Sahara dust fertilizes the rainforests of the Amazon basin, as recent meteorological studies have shown. With the constant north-east trade wind, the incredible mass of 400–700 tons of it reaches every year the Amazon at an altitude of 5 km. Without this gigantic fertilizer load, the vegetation on the extremely nutrient-poor soils would never grow as lushly as we find it today.

Today, the Amazon lies in a vast lowland plain covered with sediments and sedimentary rocks, bordering the Andes to the west, the ancient low mountain ranges of the *Guyana* lands to the north, and the Brazilian Shield to the south, an ancient, eroded mountainous land. In some sections of today's Amazon, one can still see the former steep banks of the primeval Amazon: huge, million-year-old laterite cliffs rising up to 15 m, in which Amazon *Ringed kingfishers* today dig their breeding burrows (Fig. 2.3).

The slope of the river from the foot of the East Andes to its mouth is only an incredible 180 m, which is only 3 cm/km of river! Despite this extremely low gradient, the river flows at 0.75 m/s even in the dry season, which is 45 m/min or 2.7 km/h. In the rainy season, when the water masses from the many tributaries push into the main stream, the flow velocity increases up to 18 km/h. Due to the ongoing deforestation of the rainforest, the forest loses