



Thus she was enabled to ascend the rapids. Three miles farther up the river another rapid similar to the last was found, and ascended in the same way. The next obstacle was by far the most formidable one. Several islands situated in the river are connected with the banks by rocks, over which the river falls. Here the 'En Avant' had to be unmounted and unloaded, and the hull was hauled up the fall with great difficulty. Captain van Gèle describes this region as follows:—

"The country is beautiful. The banks of the river are bordered by hills of gentle slope, with woods and prairies, plantations of bananas, and fields of maize. Most of the villages are situated on the slopes of the hills. Seen from afar, the huts give the impression of Swiss cottages. If there were herds of cattle grazing on the prairies, the illusion would be complete. The country seems to be of great fertility, the grass attaining in some places a height of twenty feet.

"The fronts of the villages situated on the banks of the river are fortified by stockades. On high trees of cottonwood, guards are stationed in rudely constructed huts, which have given rise to the legend of aerial villages. I have not seen any manioc or palms in this district, while bananas, sugar-cane, and maize abound. Up to the third rapid the natives are of the same type as those living farther south on the river. Their heads are shaved, and their heavy mustaches give them a military air. Their faces are not tattooed. We were very kindly received by this people. Above the third rapid a new tribe was met with,—the Bakombe, who are said to occupy a great part of the territory between the Obangi and Kongo. They have a very remarkable fashion of dressing their hair. Some wear enormous chignons; others, forms similar to those worn by the Mombutu; still others, long and slender tresses, sometimes as long as six feet."

At the last rapid the waters of the river come from the northeast. The view is grand. The river is about twenty-eight hundred feet wide, and free from obstacles. Farther east its course was found to be westerly. No tributaries were discovered above the rapids. On the northern bank the country is level, while in the south a few low hills may be seen. Although not a single house is seen from the steamer, the country is densely inhabited, numerous villages being situated a few hundred steps distant from the banks of the river. The latter are called 'Dua' by the natives. There are numerous islands, most of which are inhabited and cultivated. Captain van Gèle states that the country is one of great fertility, and that more provisions were offered him than his party was able to consume. Beautiful work in iron is made by the natives, while ivory seems to be little valued. It is worth remarking, however, that it is used for labrets worn in the upper lips.

At Bemay a new rapid was met, which, however, was passed by the help of the natives. A few miles above Setema, the first tributary, the Bangaso, was seen. It is a remarkable fact that neither on the north nor on the south side are there any tributaries. The same scarceness of tributaries is observed on the Kongo: therefore it seems probable that the region between the Shari and the Chuapa is throughout occupied by rivers running east and west. After the Bangaso was passed, a new tribe was met, the Yakoma, who attacked the steamer. On Jan. 1, 1888, the 'En Avant,' which steamed along the north bank of the river, met a line of rocks forming a rapid. The steamer separated from the canoe in order to search for a pass. Immediately numerous natives attacked the canoe. At the same time the steamer struck a rock, and it was necessary to unload and to make a landing among the hostile natives. Lieutenant Liénart, who was charged with this task, was kindly received, but only to be attacked the more vigorously later on. In the ensuing struggle two of his men were killed. After all, the steamer was reloaded and repaired on an island; but the hostility of the natives, and the fact that the water of the river was falling rapidly, made it necessary to return at once. The expedition had reached  $21^{\circ} 55'$  of longitude, the distance to the farthest point of Junker being some seventy miles. It is in this unknown stretch that the Mbomo empties itself. The return was effected without casualties.

The important result of this expedition is to show that the Welle belongs to the Kongo system; for it would be unreasonable to doubt its identity with the Obangi any longer. There is also some prospect of having the western boundary of the Kongo basin explored ere long. Two German expeditions are pushing eastward from

Kameroons, while the English missionary Brooke is ascending the Obangi, intending to strike north-westward from Zongo.

#### SCIENTIFIC NEWS IN WASHINGTON.

The Work of the United States Fish Commission on the Atlantic Coast; the Migrations of Fishes governed by the Temperature of the Water; Isothermals to be constructed.—A Great Work by the Bureau of Ethnology; the Dictionary of North American Indian Tribes completed.—Shall the Arid Lands be reclaimed? a Magnificent Undertaking.—A New Law for the United States Fish Commission proposed.

#### The Work of the 'Grampus.'

ONE important fact has been established by the investigations of the United States Fish Commission, and that is, that the movements of the great masses of food-fishes that visit the bays and rivers of this country in summer are not governed by a desire to return to the localities where they were born, nor by the scarcity or abundance of food, but by the temperature of the water in which it is suitable for them to spawn. For instance: the shad never enter one of our bays or rivers in the spring until its temperature has become  $60^{\circ}$  F. Then they pass into the rivers, and up towards their sources, always seeking the warmer waters. They move up stream when the difference of temperature is so slight that it can only be detected by the use of a differential thermometer; but so sensitive are they with their whole bodies immersed, that they easily discover the direction in which the warmer water lies.

The reason why the attempt to plant shad on the Pacific coast failed is now known. Large quantities of little shad were planted by the United States Fish Commission in the Sacramento River. Very few of them returned, and all the attempts to stock the Pacific coast waters with shad have resulted only in distributing the fish in small numbers along the coast to Vancouver's Island, a distance of sixteen hundred miles. A few now enter the small rivers that have their sources near the coast, but nowhere do they show a disposition to come in great bodies, as on the Atlantic coast. The explanation is, that the bay is fed by rivers rising in the mountains, and bringing down melted-snow water, so that its temperature during the spawning-season for shad is only  $55^{\circ}$  or  $60^{\circ}$ . Fishes that were placed in the Sacramento River one year, therefore, never come back. If they approach the bay, they find it too cold to pass.

California salmon, on the other hand, require a temperature of from  $40^{\circ}$  to  $45^{\circ}$  for spawning. As they go up the rivers from the Pacific Ocean, the water becomes colder, and they finally reach that which is just right. But young California salmon placed in Eastern rivers do not become acclimated; in fact, they rarely come back. Of fifteen million young ones so planted by the United States Fish Commission, not more than three or four have ever been caught or seen in the rivers it was desired to stock. The water of the rivers is warmer as they go up stream, and they avoid it. The attempt to stock the rivers of southern Europe flowing into the Mediterranean Sea with California salmon has been successful for two reasons: they have not been able to get out of the Mediterranean and find other spawning-places if they desired; and they have found streams which, being fed by melting snows in the mountains, furnish the conditions sought.

Menhaden never enter rivers the temperature of which is below  $50^{\circ}$ . These fishes visited the coast of Maine in great numbers for forty years, but in 1878 suddenly disappeared. The same year the mackerel did not enter the Bay of Fundy. It is now believed that this strange phenomenon was caused by a change in the temperature of the water.

These facts being established, it becomes very important, from an economic point of view, to ascertain what changes take place during the season in the temperature of the ocean off our coast and of the bays enclosed by it, to plot isothermals, and to lay down upon charts the migrations of these isothermals as the season advances. It is believed, that, when this is done, the migrations of our summer food-fishes will also be discovered, and that their movements can be accurately predicted. This work has been assigned to the 'Grampus' for the present season. Her field will be from the capes of Virginia north. She will make careful obser-