

## Letter Inclosure No. 2, [21-25 July 1859]

*Livingstone, David, 1813-1873*

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Report

On the Navigation of the Zambesi.

[By Dr David Livingstone MD. FRGS etc H.M. Consul  
in central Africa,  
Commissioned of the Foreign Office July 26<sup>th</sup> 1859  
Read November [28]1858]

In endeavouring to form  
an estimate of the value of the Zambesi  
for commercial purposes, [it is necessary to recollect] we were  
obliged in the first instance to trust  
to the opinions of naval officers  
who had visited it; and the late  
Captain Parker together with Lieutenant  
Hoskins having declared that it was  
quite capable of being used for com-  
merce, though the Portuguese never  
did, and do not now enter it directly  
from the sea, we trusted in the testimony  
of our countrymen, and though we  
failed to find a passage in by  
Parker's Luabo, we discovered a  
safe entrance by the branch  
Kongone; and H. M. S. Lynx,  
Captain Berkely, at a subsequent  
period, found a good channel

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by the main stream ( Parkers Luabo) though  
we had failed to observe it in a three  
days search. The question of safe entrance  
from the sea having thus been satisfactorily  
solved, our attention was next directed  
to the rest of the river - the subject of  
his report.

[It is desirable also to  
remember that]in an experimental Expedition  
like ours, it was plainly an imperative  
duty to select the most healthy period  
of the year in order to avoid the fate  
of the Great Niger Expedition. Had we

come any time between January and April, a large vessel could have been taken up as far as Tette, but [that] is the most unhealthy time of the year, and we then looked on the African fever as a much more formidable disease than we do now. We entered the river in June, when the river was falling fast, but even then, the official reports of Captain Gordon R. N. and other naval officers, were precisely the same as those of Captain Parker and Lieutenant Hoskins. Their

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testimony however, referred to only about seventy miles from the sea - Mazaro - the point at which the Portuguese use of the river begins. We have now enjoyed a twelvemonths experience, which is the shortest period in which all the changes that occur annually, can be noted, and we have carefully examined the ~~whole, without attempting any regular survey~~ from the sea to Tette five times over, in a ~~shaky craft[,] of the Niger canoe or pot-bellied shape,~~ the top speed of which (3 1/2 knots)[,] admitted of nothing being done in a hurry; and may therefore be considered in a position to give an opinion of equal value to that of flying visitors, better qualified in all other respects for the task. ~~As it was expected that my companions should collect fuller information than I could formerly furnish, and~~ [As] a report on the river would be incomplete without a description of it when at its lowest, I sent the journal of M<sup>r</sup>[T.] Baines to the ~~R. G. S.~~ [Society] which was written at the worst part of the river, and in a season said by all to be one of unusual drought.

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M<sup>r</sup> B.[aines] was taken up by a southern channel which contained much less water than that which we ascended a month later but adopting that journal as shewing what the river may again become in a season of drought. I would only add that in passing from the sea

to Tette, when the river had fallen still lower than at the period when the journal was penned, we were obliged to drag the vessel over three crossings 100 or 150 feet long of from 24 to 18 inches of water. It is not however to be understood that such is then the general depth. In the broad parts of the river we have three or four channels, and the greater part of these channels contains water from 8 to 15 feet deep, even when the river has reached its lowest ebb. But we are often obliged to cross from one channel to another, and sometimes from one bank to the other, and it is in these crossings that the difficulties occur. I am not aware that anything has been written of[n] the form of the bottoms of rivers, but familiarity with that & the signs on the surface, will enable one man ~~will enable one man~~ to find three fathoms, while

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another will run aground on one or two feet. From our experience of a year in which the river was unusually low[,] and the rise deferred to a later than ordinary period, it is certain that a vessel really of 18 inches or two feet [draught] could ply at all seasons on the first 300 miles of the Zambesi.

At my suggestion a tide pole was planted at Tette by Major Secard and the lowest point the river reached in November /58 - that in which 18 inches were found in the [a] [few] crossings, adopted as the low water mark. By careful measurement with the theodolite the river was found at that point to be (964) nine hundred and sixty four yards from bank to bank, which if I remember rightly is more than twice the width of the Thames at London Bridge. At its lowest ebb it contained between 300 & 400 yards of water of various depths. the deep channel of

[0007]

this, in which the vessel lay, was from

twelve to fifteen feet deep. As it enables one to form a clear idea on the subject I may mention that we lost an anchor there when the water rose[,] and the volume of water being always considerable[,] we have no hope of getting it again by being left high and dry as a ship is represented at her anchorage in the Niger \* At Shuramba Dembe the river is 3490 yards wide or 1 3/4 geographical miles, nearly. At Shigogo it is broader probably three miles[,] but large islands divide it into five or six channels. It is evident that with such an amount of spread, if the current of the Zambesi were very rapid, a rise of several feet at Tette would be of comparatively small value at Shigago. We therefore took the precaution of marking a perpendicular rock at the East end of Lupata, adopting as at Tette the top of 18 inches at the

\* Laird & Oldfield's book (?)

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crossings as low water mark and carefully measured the velocity of the stream at the most rapid parts we knew. the result obtained both by patent and common logs was that no part of the river below Kebrabasa has a current of four knots. We were particularly suspicious as to the correctness of this result as some of our naval friends[,] judging from sight only[,] spoke of six and even eight knots. but remeasuring the common log and observing the Patent log hour after hour[,] in parts that this vessel could barely stem[,] shewed no more than 3 1/4 knots. The general current is 2 1/4 knots and under. The heights of the river observed by Major Secard in the accompanying table and by ourselves at Lupata and elsewhere[,] may therefore be considered as applicable to the whole stream. The amount of fall noticed also in the table, being only once down to 7 1/2 feet shews that the character of

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mountain torrent cannot be applied  
to the noble Zambesi any more  
than it can be to the Nile

From November to January  
the river rose gradually to 8 feet  
above low water mark. From  
the 15<sup>th</sup> January to the 15<sup>th</sup> May  
it had depth enough for a large  
vessel. Though Major Secard  
remarks that this year it attained  
only a minimum height and  
the accuracy of this is confirmed  
by the fact that only a small  
quantity of wheat is sown  
the parts flooded by the river  
being the parts employed for  
the crop. The data now submitted  
appear to prove that a vessel of  
two feet draught, such as are  
necessary for the Mississippi could  
run the whole of ordinary years.  
We knew of no other observations  
on which the navigability or non navigability  
of the river can be pronounced upon but leave  
them for the consideration of

[0010]

of those better qualified to give an  
opinion.

We have in the course of one year  
cut up into small pieces upwards  
of one hundred and fifty tons  
of lignum vitae alone, which  
according to the average prices  
in London during 1858 was  
worth about £900. This wood  
when dry was, in the absence  
of coal, the only fuel with which  
we could get up steam[,] owing  
to the boiler tubes being singularly  
placed all on one side and  
chiefly below the level of the  
fire[,] from which novel arrange-  
ment one side remains long cold  
while the other is hot like a patient  
in the palsy; and four & a half  
or five mortal hours of fuel  
burning are required to get up  
steam - yet by incessant labour

and a dogged determination to

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extract all the good [possible] out of an engine  
probably intended to grind coffee in  
a shop window, we have traversed  
2350 miles of river. Now had  
we been permitted to shew what  
could be effected in this one  
branch of commerce, it is not  
unreasonable to say that every  
time the saw went through  
lignum vitae it might have been  
to secure or dress a log. Without  
any great labour we might have cut  
a thousand instead of one hundred  
and fifty tons of that valuable  
wood, and given a practical  
exposition of what may and  
very probably soon will be  
effected by the Germans  
in Zambesi commerce.

The only paper that reached  
us up to the middle of June  
last[,] contained a short notice  
of a[the] meeting of the Royal Geographical  
Society in which some interesting  
assertions were made in connection

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with a pretty theory, and an engineering  
flaw, that the Zambesi which under  
the very serious disadvantages of that  
flaw, we have actually been navigating,  
was not navigable at all. If our  
fellow members will only believe  
that we have a merry smile on our  
faces we would venture to move,  
for the support of the theory, in  
Parliamentary fashion, that the word  
ought to be inserted thus. "Wheat ought  
not to grow at the level of the sea".  
"Indigo ought not to grow more  
than a foot high" and "it ought not  
to contain indigo at all" "The seeds  
of cucumbers and water melons  
ought not to contain a fine bland  
oil[,] fit for purposes of the table"  
because that would be like "extracting  
sun beams from cucumbers". "The  
Zambesiought not to be navigable

for commercial purposes” and  
the Steam Launch ”Asthmatic”  
”ought to have been intended to draw”  
something more than merely ”grist to the mill.”

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It is a pity that M<sup>r</sup> Laird  
volunteered a public assertion in  
direct opposition to his own official  
statement which we now have here  
in his own handwriting, for  
we go on the principle of breasting  
whatever difficulties we meet, and never blaming others if we should fail,  
and would have left un-noticed,  
the saving effected by putting a  
low pressure cylinder, to a high  
pressure engine, had he not  
publicly called for a public  
refutation on a matter of public  
interest. Instead of ”intending the  
Launch to draw [tow] only.” His words  
were ”D<sup>r</sup> Livingstone may calculate  
upon one ton for every inch  
of Displacement in the Launch,  
and as in the River he may safely  
lead her to two feet, from ten  
to twelve Tons will be available  
for stores and crew.” Twelve kroomen  
bring her down to 2 feet 2 inches without  
any fuel, stores, or cargo; and instead  
of ten knots confidently promised—

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in the same statement; a head  
wind holds her paddles so that  
even with sixty pounds of steam  
she is stopped even going down  
stream. Without coals, and it  
was only when left without this  
fuel, that we began to examine the  
matter ourselves, we can barely  
keep up with the heavy canoes  
of the Zambesi, and their [speed] equals  
the saunter of the lazy ploughboy.

If there is[be] wind enough to  
cause a slight purl on the water,  
any one ascending a river may  
observe dark blue lines stretching  
across the stream. These by  
native pilots are call ”kwéttés”, and  
betoken the edge of the banks under

water. It may be observed  
also that one bank or other of  
the river is worn so as to be  
perpendicular; and that these  
perpendicular parts alternate from  
one side to the other at greater

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or less distances according to the  
rapidity of the current. the submerged  
banks are generally of a semilunar form  
at the lower edge or part farthest  
down the stream and this is invariably  
the shortest portion in the whole bank.  
They lie diagonally to the direction of the  
river, the angle of direction being less  
or greater according as the river  
is high or low. The Kwette is the part  
immediately below the shoal edge of  
the bank[,] and the importance of  
knowing them[,] by the blue line and  
other signs[,] may be judged of by the  
fact that while in the kwette you may  
have from two to three fathoms  
up to the very edge of the convex mass,  
onit you may not have one foot.  
The formation of these banks it is  
difficult to explain without drawings  
the water actually rolls over and over  
sideways towards the part of the bank  
situated upstream, and there lies the  
deep channel. The proper course is  
to curve round [in] the kwette till the  
upper third of the submerged bank is

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reached, then enter on the bank where  
you have deep water along [towards and in] the side  
~~by being~~ [which is] cut perpendicularly. This  
which often is miles in length  
is called by the pilots "kokole". Sometimes  
the semilunar banks are placed  
in pairs, and the water between  
them is very deep; but the furrow  
of three or four fathoms ends  
in a triangular shoal. The upper  
third of one of the banks, on which  
in our bright sunshine, a distinct  
bulge shews the most water,  
is to be chosen for getting out of  
the deep channel before reaching



the shoal. My ignorance whether anything has been written on the subject, and desire to wipe out, possibly an unmerited reproach by an American author, the Rev<sup>d</sup> M<sup>r</sup> Bowen, that our officers were ignorant of the laws which determine the channel of deep water in the Niger, are offered as excuses for venturing these few remarks. If

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I succeed in inducing the better qualified among your members either to point out what has already been done in describing the bottom of rivers, or [in] working out the subject which I have but touched on, I shall not have incurred the charge of presumption in vain. In July last year we ran aground perpetually by going ahead straight. While in September when the river was much lower, M<sup>r</sup> Medlycott of H.M.S. Lynx seemed to know the kwettes & banks intuitively, and never touched at all.

These submerged sandbanks, as on the Nile, are the greatest difficulty in Zambesi navigation. Each river has its own disadvantages. The Mississippi has its snags, & it is said ~~and~~ requires vessels of a peculiar build and only two feet draught. The Hoogley has its own very peculiar difficulties of entrance & so has the landing place at Madras; But

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difficulties are not impossibilities. A great difficulty - the African fever, is, we hope, rendered less formidable, and in spite of the theory that Europeans cannot live and labour in the tropics, we find that hard work, with the good food most conscientiously supplied by M<sup>r</sup> Wilson of Glasgow, and a merry heart, have secured

as fair a share of health as we should have had in London.

From October 1858 to June 1859, 5782 Elephants tusks have gone down the Zambesi from Tette alone, of these two thirds were large or upwards of 50 lbs each, the weight of the whole were in round numbers 100 000 lbs. All merchandise is carried in large unwieldy canoes

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which cost between £60 & £70 each When loaded they draw about two feet and carry two tons at an expense of £10 sterling from Quilimaine to Tette[,] when the river is full. When the small channel between the Zambesi and the Quilimaine river is dry[,] which is the case at least nine months in the year[,] the expense is much increased by the land carriage to Mazaro. English manufactured goods come in a round about way by Banian or Gentoo traders from Bombay - and they are able [obliged] to give a larger prices for ivory than the Americans[,] who are absorbing all the trade of Eastern Africa. Several Tette merchants have been waiting at Quilimaine for months in expectation of American ships

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with cottons. For the information of mercantile men it may be added that the American calicoes are coarse, unbleached, yard wide cottons, costing at Quilimaine between 5<sup>d</sup> & 6<sup>d</sup> per yard - and muskets, inferior to English trade arms, from 26/ to 36/ each. With calicoes, guns and gunpowder, they easily secure all the trade on the East coast below Zanzibar No attempt is made to encourage the native taste for better

articles[,] which exists quite as  
strongly here as on the West  
coast. Red and blue colours  
are often unravelled, respun  
and rewoven into country  
cloths, and towards Lake  
Shirwa the only scraps of these  
colours that come into the  
country are exclusively claimed  
by the chiefs

David Livingstone