

Letter Inclosure No. 2

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 26th 1859
Read November [28]]

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
a safe entrance by the branch
Kongone; and H. M. S. Lynx,
Captain , at a subsequent
period, found a good channel

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by the main stream (Parker 's 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]n 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^r[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^r 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 fine 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. he deep channel of

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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 . [** Laird & Oldfield's book (?)*] At Shuramba Dembe the river is 3490 yards wide or $1\frac{3}{4}$ 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

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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. ut the common log and observing the Patent log hour after hour[,] in parts that this vessel could barely stem[,] shewed no more than $3\frac{1}{4}$ knots. The general current is $2\frac{1}{4}$ 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 $7\frac{1}{2}$ 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 15th January to the 15th 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

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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 arrangement 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
Zambesi~~ought~~ 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 Mr 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 drawtow only." His words were "Dr 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 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 "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. he 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^d
M^r 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^r 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^r 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^d & 6^d
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