

Article

Transoceanic Introduction of a Freshwater Gastropod of Major ONE HEALTH Importance in Nigeria

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Abstract

Invasive gastropods pose significant risks to ecosystem stability and public health by acting as intermediate hosts for parasites like *Fasciola* spp. During malacological surveys across Nigeria (2024–2025), populations of a previously unknown lymnaeid snail were discovered in two distinct habitats. Using an integrative taxonomic approach combining morphological examination and COI DNA barcoding, the species was identified as the Neotropical liver fluke snail *Galba cubensis*. Phylogeographical analysis revealed that Nigerian specimens share a common haplotype widespread in the Americas, Europe, and Asia, indicating a major transcontinental range expansion. While xenomonitoring of four specimens showed no current trematode infections, *G. cubensis* is a primary intermediate host for *Fasciola hepatica*. The establishment of this highly adaptable species in West Africa raises urgent ONE HEALTH concerns, including potential parasitic overspill and competition with native snails like *Radix natalensis*. Freshwater gastropod invasions in Nigeria, cryptic invasions in Africa, and future developments are discussed. The findings of this study emphasize the necessity of dedicated malacological surveys and risk management to address the spread of globally invasive freshwater snails.

Keywords: invasive species; global invasion; parasites; neglected tropical disease; *Fasciola*; *Galba*; Lymnaeidae



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1. Introduction

Species introduction beyond their natural borders can disrupt ecosystem food webs and cause major health issues such as parasitic spillover, the spread of zoonoses, and immediate infections [1]. Besides established native parasite–host systems, introduced hosts and parasites can pose new challenges for both the public and veterinary health sector [2]. Often, such introductions go unnoticed, especially in the beginning of an invasion process [3]. Even the effects that such species have might be overlooked for significant periods of time [4]. Such effects might range from single species interactions to functional effects on the ecosystem level, including host–parasite interactions.

Important parasitic diseases include waterborne diseases with gastropods involved as intermediate hosts, especially in neglected tropical diseases such as schistosomiasis or

fasciolosis [5]. Introduced gastropods of biomedical importance have been recognized in various regions of the world [6]. Likewise, the introduction of parasites such as *Schistosoma* to regions where no schistosomiasis occurred previously has been shown. A recent example that gained wide-ranging attention was the first occurrence of schistosomiasis in Europe, specifically on Corse Island [7]. Generally, less recognized are introductions that are relevant for livestock or wildlife [8]. Such cases likely occur relatively frequently but often remain undocumented [9]. ONE HEALTH surveys have resulted in the discovery of introduced gastropod species in any given region [10,11]. Their often-unknown diversity of potentially associated trematode parasites might pose significant risks for the native fauna, livestock and humans alike [10,12].

Many species of the pulmonate freshwater gastropod family Lymnaeidae act as intermediate hosts of various trematodes [13,14]. Fasciolosis is a major but often neglected tropical disease for both humans and livestock, but also wildlife [15,16]. Toet et al. [17] estimate that the annual worldwide losses related to fasciolosis are US \$3 billion caused by liver condemnation, decreased production of meat and milk, and the anthelmintic treatments needed. In Africa, the disease is widespread but often neglected, and two species of biomedical relevance, *Fasciola gigantica* and *F. hepatica*, as well as potential hybrids occur [8,18]. The most important and widespread intermediate host gastropod species in sub-Saharan Africa is *Radix natalensis* [19]. In a few regions in eastern and southern Africa, *Galba* species act as intermediate hosts for *Fasciola* [20]. Recent years have seen repeated introductions of lymnaeid gastropod species which are either known or potential hosts for *Fasciola* species [10,11]. These introductions stem from disparate continents and have raised concerns related to new trematode species or lineages [10,11], parasitic overspill [21], and hybridizations [22]. The introductions of lymnaeid species often go unnoticed because of shell morphostasis [23], a lack of malacological surveys [24,25] and, generally, insufficient taxonomic expertise [26]. Such introductions can lead to the establishment and subsequent spread of new species in African freshwaters resulting in a phenomenon called cryptic invasion [24]. It is believed that the extent of cryptic invasions is highly underestimated. This is even more true for the effects and consequences of such invasions on species communities and ecosystems alike [24].

Pseudosuccinea columella is the most prominent and extensively spreading lymnaeid invader in southern Africa, where it is a host for *Fasciola gigantica* [9]. It has also been shown to replace native *Radix natalensis* [27]. Recent Asian lymnaeid invaders are *Radix rubiginosa* in South Africa [28] and *Orientogalba viridis* in Malawi [11].

In contrast, western Africa is known to have received freshwater gastropod introductions, but no lymnaeids have been recognized yet. *Radix natalensis* is the sole known host for both *Fasciola* species, which occur either alone or in sympatry [18]. Hybrids have not yet been identified from Nigeria [18]. An extensive malacological survey in nine states of Nigeria revealed a previously unknown species of Lymnaeidae, which was preliminarily identified as a *Galba* sp. Given that *Galba* spp. serve as intermediate hosts for various trematodes of medical and veterinary importance, we studied the newly discovered populations. In the light of its potential implications for Nigeria's public or ONE HEALTH sector, we:

- (1) Determine species identity using an integrative taxonomic approach based on shell morphological examination and DNA barcoding;
- (2) Trace the origin of the introduced populations and infection status using phylogeographical methods and xenomonitoring;
- (3) Evaluate the importance of the introduction for the ONE HEALTH context in Nigeria and beyond.

2. Materials and Methods

2.1. Study Sites and Sampling Procedure

Freshwater mollusks were collected during malacological field surveys in Nigeria in 2024 and 2025 by F.F. Hinmikaiye. To ensure representative sampling across 9 states (Anambra, Cross River, Ebonyi, Ekiti, Enugu, Kwara, Ondo, Osun, Plateau) in 4 geopolitical zones (South-East, South-West, South-South, North-Central), a total of 135 localities were sampled, including natural (e.g., lakes, wetlands and streams) and non-natural (reservoirs or dams, irrigation channels and rice plantations) habitats. The survey was carried out with the aim of covering primarily water bodies near human and livestock activities. Mollusk specimens were collected in shallow water using sieves and hand-picking, thus covering water depths from 0 to c. 1.5 m. Habitat characteristics were recorded following a standardized protocol. Water parameters such as temperature, pH, and electric conductivity were also recorded on site using standard tools such as multiparameter Hanna instruments (Woonsocket, RI, USA), whereas phosphate and nitrate were tested in the laboratory at the University of Nigeria, Nsukka. Locals were interviewed regarding the human use of the respective water bodies and specifically about water abstraction and livestock interaction on the water bodies. All specimens were preserved in 80% ethanol and determined to the genus level in the laboratory based on shell morphology using the identification key of Brown [29]. The material was stored in the UGSB (University of Giessen Systematics and Biodiversity) collection located in Germany. This study focuses on two localities where a previously unknown lymnaeid snail type resembling *Galba* spp. was found, which are not known to occur in this part of Africa.

2.2. DNA Extraction, Amplification and Sequencing

DNA extraction of foot tissue (~20 ng) was performed for a total of six *Galba* sp. snail specimens (voucher numbers: UGSB 31095–UGSB 31100). Before DNA extraction, image vouchers were produced for each specimen using a digital microscope (Keyence VHX-7000, Osaka, Japan). DNA isolation was performed using a standard CTAB protocol for mollusks described by Wilke et al. [30]. For the amplification of the standard barcoding, gene fragment COI (mitochondrial cytochrome c oxidase subunit 1) primers LCO1490 and COR722b ([31,32] respectively) were used for the genetic characterization of the specimens. The PCR cycling conditions were set according to the method described in [33]. Bidirectional sequencing was performed on an ABI 3730 XL sequencer (Life Technologies) at LGC Genomics (Berlin, Germany).

2.3. Barcoding and Phylogeographic Analyses

Adopting a molecular barcoding approach, a nucleotide BLAST (BLASTn suite, vs. 2.17.0+: megablast) search was conducted, returning highly similar sequences (sorted by percent identity) stored in the NCBI GenBank database. This analysis was conducted to obtain a species-level identification of the unknown *Galba* sp.

The molecular dataset was supplemented with COI sequences from *G. cubensis* and *G. neotropica* available at the NCBI GenBank database (see Table 1). The final dataset comprised 53 sequences (655 bp length; 5 new in this study) from 9 different countries (i.e., Argentina, Colombia, Cuba, Nigeria, Peru, Spain, USA, Uruguay, and Venezuela). The alignments of the protein-coding COI fragments were carried out by eye using BioEdit v7.2.5 [34].

A statistical parsimony haplotype network was constructed using TCS v1.21 ([35]; connection limit = 95%) to reveal the status of the newly discovered populations and their phylogeographical links in a global context.

Table 1. List of haplotypes of *Galba cubensis* specimens used from NCBI GenBank. * Haplotype 1 (HT01) includes newly sequenced specimens from Nigeria, Africa). Note that *B. cubensis* = *Bakerilymnaea cubensis* is a synonym of *Galba cubensis*.

Haplotype No.	Species	GenBank Accession No.	Country	Source
HT01 *	<i>B. cubensis</i>	AM494009	Cuba	[36]
	<i>G. cubensis</i>	JN614390	Colombia	[37]
	<i>G. cubensis</i>	JN614391	Colombia	
	<i>G. cubensis</i>	JN614392	Colombia	
	<i>G. cubensis</i>	JN614393	Colombia	
	<i>G. cubensis</i>	KT781287	USA	Direct submission
	<i>G. cubensis</i>	KT781336	USA	
	<i>G. cubensis</i>	KT781341	USA	
	<i>G. cubensis</i>	KY612856	USA	
	<i>G. cubensis</i>	LT623604	Spain	[38]
	<i>G. cubensis</i>	MW915587	Brazil	[39]
	<i>G. cubensis</i>	PQ826311	Azerbaijan	[40]
	<i>G. cubensis</i>	PX641124	USA	Direct submission
HT02	<i>G. cubensis</i>	LT623605	Spain	[38]
HT03	<i>G. cubensis</i>	KT781286	USA	Direct submission
HT04	<i>G. cubensis</i>	KT781295	Venezuela	
	<i>G. cubensis</i>	KT781296	Venezuela	
	<i>G. cubensis</i>	KT781325	Venezuela	
	<i>G. cubensis</i>	KT781326	Venezuela	
HT05	<i>B. cubensis</i>	FN182205	USA	[37]
HT06	<i>G. cubensis</i>	JN614394	USA	
	<i>G. cubensis</i>	JN614395	USA	
	<i>G. cubensis</i>	KT781331	USA	
	<i>G. cubensis</i>	PX532206	USA	
	<i>G. cubensis</i>	PX585262	USA	
	<i>G. cubensis</i>	PX592357	USA	
HT07	<i>G. cubensis</i>	JN614396	Uruguay	[37]
HT08	<i>G. cubensis</i>	KT781300	Venezuela	Direct submission
HT09	<i>G. cubensis</i>	KT781321	Venezuela	
HT10	<i>G. neotropica</i>	JF461485	Venezuela	[41]
	<i>G. cubensis</i>	KT781308	Venezuela	Direct submission
	<i>G. cubensis</i>	KT781312	Venezuela	
	<i>G. cubensis</i>	KT781327	Venezuela	
HT11	<i>G. neotropica</i>	JF461486	Venezuela	[41]

Table 1. Cont.

Haplotype No.	Species	GenBank Accession No.	Country	Source
HT12	<i>G. neotropica</i>	AM494008	Peru	[36]
	<i>G. neotropica</i>	JN872453	Argentina	[42]
	<i>G. cubensis</i>	KT781280	Peru	Direct submission
	<i>G. cubensis</i>	KT781281	Peru	
	<i>G. cubensis</i>	KT781298	Argentina	
	<i>G. neotropica</i>	KX781341	Uruguay	[42]
	<i>G. neotropica</i>	KX781342	Uruguay	
HT13	<i>G. cubensis</i>	KT781285	Peru	Direct submission
HT14	<i>G. cubensis</i>	KT781277	Argentina	
	<i>G. cubensis</i>	KT781278	Argentina	
HT15	<i>G. cubensis</i>	KT781284	Peru	
HT16	<i>G. neotropica</i>	JN872454	Argentina	[43]
HT17	<i>G. neotropica</i>	KT215350	Argentina	[44]
HT18	<i>G. cubensis</i>	KT781297	Argentina	Direct submission
HT19	<i>G. neotropica</i>	JN872452	Argentina	[43]
HT20	<i>G. neotropica</i>	FN356741	Argentina	[45]

2.4. Parasite Screening

Full soft body tissues from twenty adult specimens (ten from each location) and tissue from two mature *Fasciola gigantica* flukes originating from Rwanda (used as positive controls) were used for DNA extraction according to the manufacturer's instructions (DNeasy Blood & Tissue Kit, Qiagen, Germany). Trematode infection was assessed using a xenomonitoring approach based on a multiplex Rapid Diagnostic PCR (for details, see [21]). Shells were retained as vouchers in the UGSB collection (see above).

Multiplex PCR reactions were performed in a total volume of 15 µL, containing 7.5 µL of Q5® Hot Start High-Fidelity 2X Master Mix (New England BioLabs, Ipswich, MA, USA), 1 µL of template DNA (1:10 diluted), and primer pairs at final concentrations of 0.2 µM for 18S_Digenea_F and 18S_Digenea_R [21], 0.1 µM for FW_SNAIL2 and REV_SNAIL2 [21] and 0.3 µM for the *Fasciola*-specific F and R primers published by Krämer and Schnieder [46]. The remaining volume was adjusted with nuclease-free water. PCR conditions were as follows: initial denaturation at 98 °C for 30 s, followed by 32 cycles of denaturation at 98 °C for 10 s, annealing at 62 °C for 20 s, and extension at 72 °C for 30 s, with a final extension at 72 °C for 2 min. Amplicons were visualized by electrophoresis on 3% agarose gel run for 1 h at 80 V.

3. Results

3.1. Ecology and Gastropod Communities

A morphologically identified *Galba* sp., based on shell shape, size, and shell surface parameters, was found in only two out of 135 sites, in largely different habitats approximately 120 km apart from each other (straight-line distance). The species was found in a lacustrine habitat, Agba Dam, an earth-fill dam with (semi-)natural aquatic vegetation around its shoreline, except at the actual dam (Table 2). Fourteen specimens of *Galba* sp. were collected

(of which three were sequenced: PZ724462–PZ724464). The species was associated with various typical gastropods including *Physella acuta*, *Bulinus* spp., and *Melanoides tuberculata*.

Table 2. Sampling site information.

Locality	Location	Altitude	Latitude	Longitude	Water Parameters
Agba Dam	Kwara State, Oko Erin, Ilorin, Agba Dam lake, northern shore	322 m a.s.l.	8.47782° N	4.58961° E	Temperature 25.3 °C pH 6.87 conductivity 380 µS/cm phosphate 0.12 mg/L nitrate 8.39 mg/L
Stream	Unnamed permanent stream, west of the main road, south of Ekiti State University, north of Ado Ekiti town	383 m a.s.l.	7.69908° N	5.25858° E	Temperature 26.2 °C pH 7.81 µS/cm conductivity 195 µS/cm phosphate 0.81 mg/L nitrate 9.82 mg/L

The second site (unnamed stream) at which *Galba* sp. was found is contrasting. It represents a permanent lowland stream with little vegetation and relatively clear but iron-rich water (Figure 1). Thirty of the snails (of which two were sequenced: PZ724465–PZ724466) were found to be associated with various other species, including *Bulinus* spp. and *Melanoides tuberculata*. Importantly, the same unnamed stream was also inhabited by another lymnaeid snail, *Radix natalensis* (Table 3).

3.2. Species Identity and Phylogeographic Analysis

The statistical parsimony network analysis of the 53 COI sequences resulted in a single network with 20 different haplotypes (HT01–HT20), which were separated by a maximum of 22 mutational steps (see Figure 2). The network shows that the Nigerian specimens share a common haplotype (HT01) of *Galba cubensis* (L. Pfeiffer, 1839). This dominant haplotype in the network also occurs in the Americas, Europe and Asia. Note that for Europe, two haplotypes (HT01 and HT02) were identified, which are separated from each other by only one mutational step.

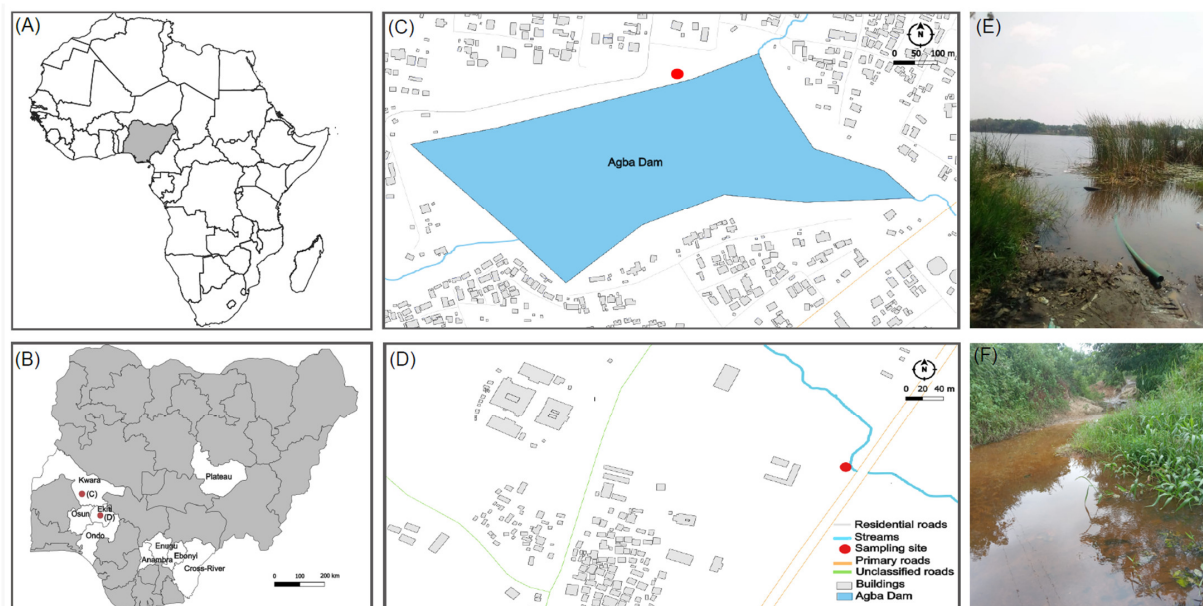


Figure 1. Locations of the *Galba cubensis* populations in Nigeria. (A) Position of Nigeria in Africa, (B) *Galba cubensis* localities in the federal states Ekiti in South-West geopolitical zone and Kwara in

North-Central geopolitical zone, (C) Agba Dam near Oko Erin with the sites surveyed, (D) unnamed stream north of Ado Ekiti town, (E) Agba Dam habitat at collecting site, (F) stream habitat at collecting site.

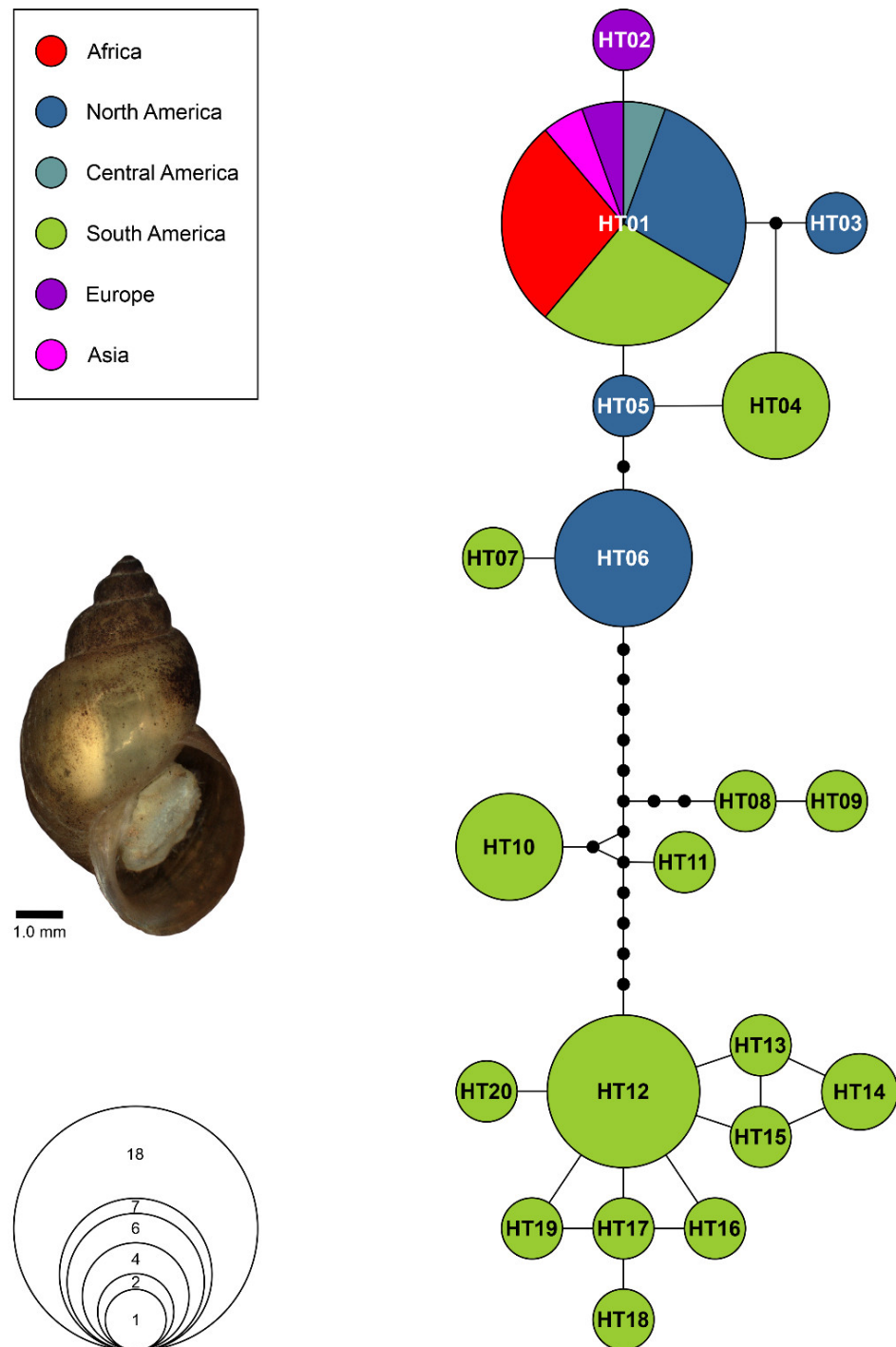


Figure 2. Statistical parsimony network of *Galba cubensis* specimens based on mitochondrial COI data (53 sequences: 48 from GenBank and 5 from this study). The size of the circles corresponds to the number of specimens they represent (i.e., smallest circle = 1 specimen; biggest circle = 18 specimens). In addition, a voucher image of Nigerian *Galba cubensis* is shown (voucher number UGSB 31095; GenBank accession number to be provided).

Table 3. Habitat, mollusk community, and human impact information.

Locality	Habitat Description	Mollusk Association at Site	Mollusk Association in the Habitat	Human Impact
Agba Dam	Earth-fill dam lake with aquatic macrophytes along the shorelines, sandy, muddy substrate	<i>Galba cubensis</i> , <i>Physella acuta</i> , <i>Bulinus forskalii</i> , <i>Bulinus</i> sp., <i>Melanoides tuberculata</i> (shells)	<i>Galba cubensis</i> , <i>Physella acuta</i> , <i>Bulinus forskalii</i> , <i>Bulinus</i> sp., <i>Melanoides tuberculata</i> , <i>Cleopatra</i> sp., <i>Lanistes</i> sp.	Man-made, pollution, water abstraction, fishing, boating
Stream	Lowland stream, sandy substrate with few pebbles and rocks. Little in-stream vegetation	<i>Galba cubensis</i> , <i>Bulinus forskalii</i> , <i>Bulinus</i> cf. <i>truncatus</i> , <i>Melanoides tuberculata</i>	<i>Galba cubensis</i> , <i>Radix natalensis</i> , <i>Bulinus forskalii</i> , <i>Bulinus</i> cf. <i>truncatus</i> , <i>Melanoides tuberculata</i>	Irrigation of water, pollution

3.3. Parasite Infections

None of the specimens used for xenomonitoring showed bands indicative of trematode infections.

4. Discussion

4.1. Freshwater Gastropod Invasions in Nigeria

Nigeria is largely affected by invasive freshwater species ranging from macrophytes to fish species [47,48]. The country also has a long history of species introduction, especially among freshwater mollusks. In fact, it was the first African country in which the introduction and subsequent invasion were recognized—as early as the 1980s in the case of the Asian *Indoplanorbis exustus* [49,50]. An Australian origin is known for *Amerianna carinata* found in several localities at man-made lakes in Nigeria [51]. There can be a considerable time lag before invasive species become recognized, especially if they resemble morphologically native species as, for example, in the case of invasive *Physella acuta*, which is regularly confused with native *Bulinus* species, even though they belong to very different hygrophilan families [24]. The case of a cryptic invasion involving two physids also prominent in Nigerian freshwater systems has recently been demonstrated [24]. What is evident from a survey of freshwater gastropod invasions in Nigeria is the fact that often man-made water bodies such as dam lakes or disturbed habitat become invaded. The Agba Dam is a typical dam lake, of which hundreds exist all over Nigeria [52]. The second locality in which *Galba cubensis* was found is more natural, though not unaffected by human activities such as pollution. The species is known to be highly adaptable, and in Europe occurs in sites heavily impacted by pesticides [38]. *Galba cubensis* is an amphibious species that is known to thrive in shallow waters and the edges of plant-rich habitats of both lacustrine and riverine systems [53]. Fluctuations in water availability are easily survived since the species is amphibious. However, the sites invaded in Nigeria have a complex fauna of gastropods, evidencing permanent water availability. The species apparently integrates easily into existing gastropod communities and even co-occurs in the same stream with *Radix natalensis*, the native intermediate host of liver flukes in Africa. This integration is important since it is different from what is known in other freshwater invasive species such as *Physella acuta*, which often thrive when native gastropods have disappeared due to the level of disturbance [54] or due to competitive superiority [55]. The competitive potential of *Galba cubensis* in Nigeria cannot be estimated for the time being and given the number of locations known. *Galba cubensis* is often found in the same regions as other lymnaeid snails,

such as *Pseudosuccinea columella* in Cuba and *Galba humilis* in California [56,57]. In Cuba, these two species exhibit different ecology and distribution patterns, suggesting a potential outcome of resource partitioning to minimize direct competition, a common ecological phenomenon [56].

There is no evidence for the origin of the Nigerian population. The phylogeographical pattern obtained hints to a long-distance flash invasion pattern, as evidenced for *Pseudosuccinea columella* [58]. A direct colonization from the native range in the Americas is perhaps more likely than from Western Europe, where the species is still very restricted. The means of introduction can only be speculated upon. Deliberate introduction is less likely for a small species of no commercial value. Horticultural activities, as discussed for the European population in Spain [43], also seem less likely in Nigeria. Other lymnaeid invaders have been associated with rice production, such as Asian *Orientogalba viridis* in rice fields in Malawi [11]. Although Nigeria is the largest rice producer in Africa [59], it is remarkable that the current localities are not related to rice production. Future records might help to disentangle the invasion history. The detection of *G. cubensis* in Nigeria is a matter of random finding. This is similar for other cryptic invaders among lymnaeid snails (e.g., [10,11]). Ideally, future malacological surveys in adjacent countries should be informed about the potential presence of *Galba cubensis*, which is naturally not included in standard field guides and determination books of freshwater invertebrates of Africa.

4.2. Cryptic Invasions in Africa

Galba cubensis cannot be distinguished morphologically from African *Galba mweruensis* and European *Galba truncatula*. Confusion is less likely, though, because of the geographical restriction of either of these two species. *Galba truncatula* is restricted to the Palearctic and *G. mweruensis* to high altitude and southern temperate climates in Africa [20]. Unlike in the invaded regions in Spain [38] and Azerbaijan [40], no native *Galba* species occur in western Africa [20]. *Galba cubensis* might be much more widespread already given its cryptic nature, and the restricted sampling might have largely overlooked it. In fact, this tropical–subtropical species, which is native to the Neotropics (Caribbean, South America and southern North America), is invasive at least in south-west Europe [38] and as far east as Azerbaijan in Eurasia [40].

A common characteristic of cryptic invasions is their late detection. The number of such species present in ecosystems is unknown and cannot easily be estimated, especially in Africa [24]. The relatively frequent observation of introduced species within the freshwater hygrophilan snail family Lymnaeidae alone might suggest that the phenomenon is much more widespread than was previously assumed. It should be noted that almost all detections are incidental observations made during surveys designed for other purposes or completely random findings. To the best of our knowledge, no large-scale, specific project or program for invasive freshwater mollusks exists anywhere in Africa. This is an important shortcoming, given the potential effects of such species on ecosystems, human health and animal health, as in the case of snails that are hosts of medical and veterinary importance. In this context, it is interesting to note that, on average, the impacts of invasive species are disproportionately larger in the Global South [60]. However, much more research is needed to better understand the importance of invasive species in general, and of freshwater invertebrates in particular.

This study found that *Galba cubensis* is now in another continent, Africa. As such, and given its established contemporary distribution, it might easily qualify as the next global invader among freshwater snails. It stands in line with freshwater pulmonated snails such as *Pseudosuccinea columella* [58] and *Stenophysa marmorata* [24].

4.3. Future ONE HEALTH Implications

The liver fluke snail *G. cubensis* is the most important intermediate host for the liver fluke species *Fasciola hepatica* in the Caribbean and in the southern USA and a potential intermediate host for the significantly larger liver fluke *Fascioloides magna* [13]. In the south-eastern USA, the snail species is also considered an intermediate host for the parasitic mammalian sucking worm *Heterobilharzia americana*, which causes major damage in live-stock farming [61]. *Galba cubensis* has wide distribution potential in South America but now also in Africa, where a wide range of suitable habitats exists. This raises public health concerns for Africa. Only a very limited number of specimens could be screened for parasite infections. Even though the monitored specimens were not infected, it does not mean that the newly established populations do not support either parasites that were introduced or new ones originating from sympatric snails in Nigeria. In fact, it is very unlikely that the whole population would be parasite-free. Additionally, the number of *Galba cubensis* specimens available for xenomonitoring was comparatively low. Given the low natural infection rate of around 2% for *Galba truncatula* in Europe and Asia, we could have missed an infection [62]. Conversely, the populations studied may still be free of certain parasites if they originated from source populations with a low infection burden. This would give them an advantage over native snails in the same environment, at least temporarily. Thus, the newly established *Galba cubensis* populations would benefit from an effect known as ‘enemy release’ in invasion biology [63].

The increasing number of lymnaeid invasions in African waters based on random detection indicates that the phenomenon might be largely underestimated [9–11]. Dedicated surveys are needed to detect introductions of non-native gastropods, ideally in an early stage, including (potential) intermediate host species for trematode parasites. Tests of natural or experimental capacity for the transmission of introduced and/or African parasites should be conducted.

5. Conclusions

The herein reported established populations of *Galba cubensis* in Nigeria add to growing evidence of a significant transcontinental range expansion into Africa. The conquest of several continents, including Africa, might qualify this species as globally invasive. The circumstances under which the species has established, as well as the ecological characteristics in its native range, presuppose that *G. cubensis* might cause ecological consequences in its newly established range. Such effects could include competition with native species. Even though the actual health implications of this new species in the African malacofauna need to be established, it is important to be aware of the presence of this species when it comes to risk management. Such a cautionary note does not only apply to Nigeria, but elsewhere in tropical Africa, too.

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