International Journal of Agriculture, Environment and Bioresearch

Vol. 07, No. 04; 2022

ISSN: 2456-8643

PARASITOFAUNA OF GIANT AFRICAN SNAILS (Achatina achatina) COMMERCIALISED IN DALOA (CENTER-WESTERN IVORY COAST)

SYLLA Idrissa*, KONE Mamadou, YEBOUE Kouadio Félix, DIOMANDE Boué Ismaël and KOFFI N'Goran Mathurin

Jean Lorougnon GUEDE University, Laboratory of Tropical Biodiversity and Ecology,B.P. 150 Daloa, Ivory Coast

https://doi.org/10.35410/IJAEB.2022.5744

ABSTRACT

Snails of the Achatina achatina species were collected at the markets of Daloa. Specifically, it was about identifying the species of parasites encountered at each collection site and their prevalence, then informing the intensity of infestation of each specie of parasites from the freshly emitted faeces. The flotation method that was used yielded the following results: On all three sites, the results showed the presence of larvae and eggs of Strongyloides sp, larvae of Rhabditis sp, and larvae of Harpacticoida sp . The parasite prevalences recorded are respectively 48.9% of Strongyloides sp larvae, 20% for Rhabditis sp and 31.1% for Harpacticoida sp. These results showed that the identified parasites can be transmitted to humans through snails.

Keywords: Parasites, Giant African Snails, Achatina achatina, Daloa.

1. INTRODUCTION

The Edible land snails are an important source of animal proteins for human beings (Igbinosa *et al.*, 2016). In West Africa, the Achatina and Archachatina genera are highly valued by people (Karamoko *et al.*, 2016) and are collected from agricultural planting areas and forests during the rainy season (Otchomou *et al.*, 1997, Kouassi *et al.* , 2007). To meet the growing demand, snail farms have been created to ensure the maintenance of supplies and ensure the rational management of this wild fauna. Indeed, due to anthropogenic activities such as the usage of pesticides, slash and burn agriculture and deforestation added to the intensive collection of snails for commercial or consumption purposes, we observe a strong decrease in the populations of snails. edible snails (Cobbinah *et al.*, 2008).

According to some researchers, the high rate of snail consumption in urban areas is due to consumers' desire to avoid red meat for health reasons (*Omole et al.*, 2007). Snail meat provides all of the amino acid requirements for humans (Adeyeye, 1996) with a relatively high iron content and low fat (Agbogidi *et al.*, 2008).

Despite the benefits associated with the consumption of snails, it could be a source of human infection, especially when the flesh consumed is undercooked or handled with open wounds. Among other evidence of parasitic infections, a recent report showed the susceptibility of giant African land snail to the rat lungworm parasite, Angiostrongylus cantonensis, (Iwanowicz *et al.*, 2015) with the increasing risk of transmission to humans and animals (Reece *et al.*,2013).

Although studies on bacterial infections of giant snails exist in Côte d'Ivoire (Koffi et *al.*, 2019), no studies have been recorded on parasites infesting giant snails in the Daloa region. The general

Vol. 07, No. 04; 2022

ISSN: 2456-8643

objective of this study is to contribute to the health safety of the consumption of giant snails encountered in the markets of the city of Daloa.

Specifically, this study aims to identify the species of parasites encountered at each collection site and their prevalence.

2.MATERIALS AND METHODS

Study environement

Description of the study area

Located between 6°52'38 N and -6°27'0 W, Daloa is a city in a forest zone in the Center-West of Côte d'Ivoire. Daloa is the capital of the Haut-Sassandra region. This department covers an area of 82 km2, it has 261,789 inhabitants according to the general population and housing census (RGPH) in 2014. Daloa is an economic hub for cities from the center west. The soil is of the reworked ferralitic type, with a sandy-clay texture, rich in humus (Koffie-B & Kra, 2013). The city of Daloa evolves in a regional framework characterized by strong agricultural potential; it is equipped with road infrastructures facilitating regular traffic of agricultural products.

Sampling sites

The Lobia 2, Orly and Grand Marché markets have beed chosen as the study site because of the high supply of snails in these markets (Figure 1).

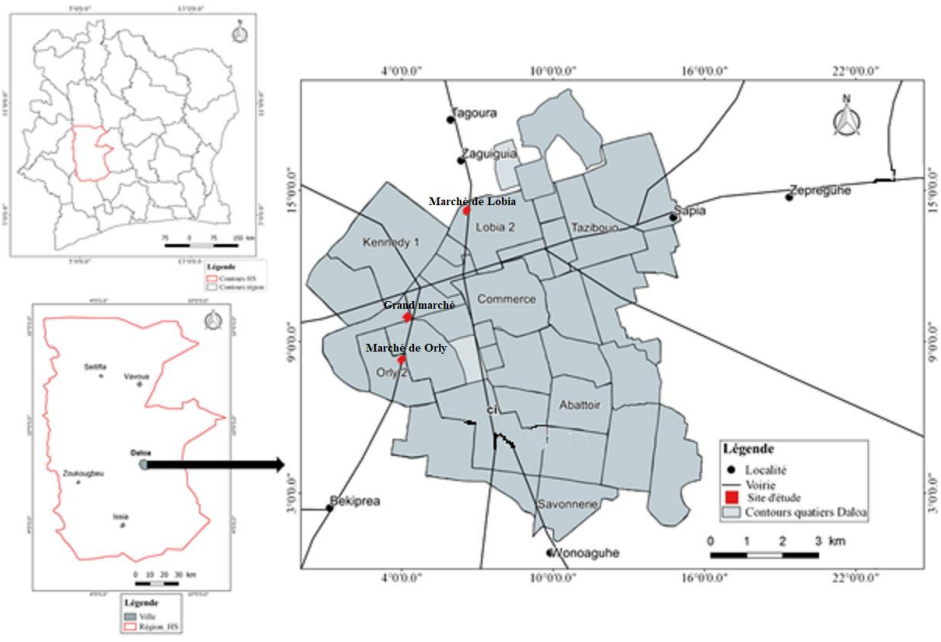

Figure 1: Location of sampling sites

3. MATERIAL

The biological material used includes the *Achatina achatina* snails species. A total of 150 specimens were purchased :

Vol. 07, No. 04; 2022

ISSN: 2456-8643

- 50 specimens for the Lobia 2 market,
- 50 specimens for the Orly market and
- 50 specimens for the Grand Marché market.

4. METHODS

Live and shell-intact, undamaged specimens were included in this study. The snails were stored in sterile plastic bags and then transported to a clean cooler.

The snails were kept in the laboratory in different containers and then covered with pieces of impregnated mosquito net. Snails are randomly selected for analysis. The specimens are each placed in a hermetically sealed box for 24 hours. The faecal matter emitted is collected for the search for parasites.

The faeces freshly emitted by the snails are carefully analyzed.

Parasitological study

For the parasitological study, the flotation technic is the one that was used because this technic is generally the most used, the easiest to perform, the fastest, inexpensive and sensitive. (*Beugnet et al.*. 2004).

Principle : Dilute the sample in a high density solution in order to bring the parasitic elements to the surface of the liquid (while the debris sinks to the bottom).

Parasite count

According to (Gordon & Whitlock, 1939) the multiplication coefficient is defined according to the degree of parasitism and the amount of faecal matter. In case of low parasitism of the "total" reading of the slide; the multiplication coefficient is then: X 15.

For the examination of a flotation blade, the detection threshold is considerably lowered to a level which is “less than 15 per gram” and which we conventionally estimate at 7 per gram of faecal matter. In our study, the number of parasites will be determined by multiplying the multiplication coefficient which is 7 per gram and the number of parasites observed.

Total number of parasites: 7 x Number of parasites found.

5.RESULTS

The parasites identified during our study on the snails belong to the groups of Nematodes and Copepods with the following species: Strongyloides sp (larva), Rhabditis sp (larva), Harpacticoida sp (larva) and Strongyloides sp (larva en egg).

The distribution of the parasites isolated according to the sampling sites shows that Strongyloides sp is the parasite identified at the three sites, followed by Rhabditis sp and Harpacticoida sp. Strongyloides sp eggs are present in almost all the snails analyzed.

All snails that harbor Strongyloides sp larvae also harbor Harpacticoida sp larvae at all three sites studied.

Vol. 07, No. 04; 2022

ISSN: 2456-8643

Table I: Results of parasitological examination of snails at the Lobia 2 market

Species	Total parasites number	Group	Stage	Prevalence (%)
Rhabditis sp	4x7 = 28	Nematodes	larvae	33, 3
Harpacticoida sp	2x7 = 14	Copepods	larvae	16,7
Strongyloides sp	6x7 = 42	Nematodes	larvae	50
TOTAL	**84**			**100**

At the Lobia 2 market, we identified an average of 28 larvae of Rhabditis sp, is about a prevalence of 33.3%, 14 larvae of copepods of the species Harpacticoida sp, is about a prevalence of 16.7% and 42 larvae of Strongyloides, is about a prevalence of 50%. The prevalence of Nematodes which is 83.3% is much higher than the prevalence of Copepods which is only 16.7%. Strongyloides sp remains the most prevalent species in the Lobia market (Table I and Figure 2).

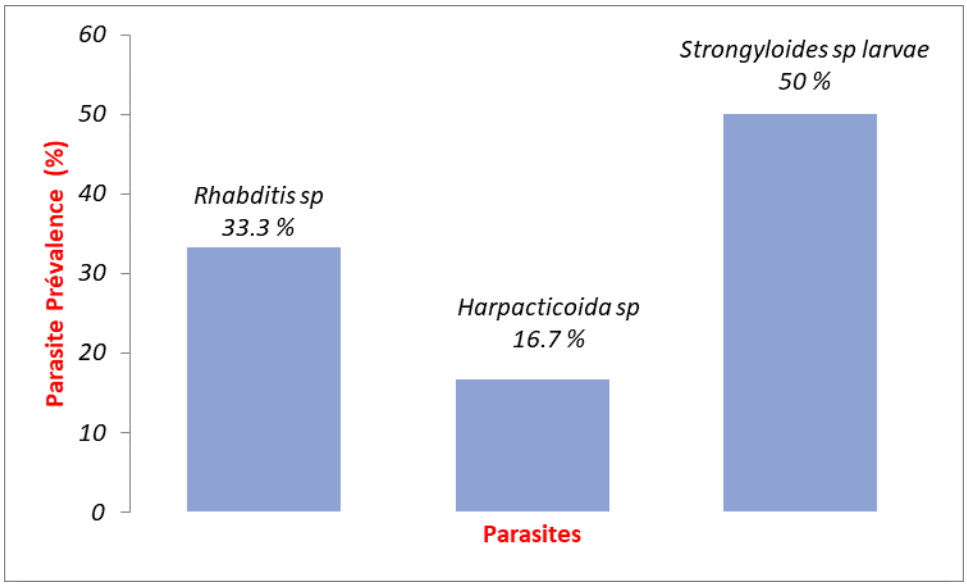

Figure 2: Prevalence of parasites encountered at the Lobia 2 market

Vol. 07, No. 04; 2022

ISSN: 2456-8643

Table II: Results of parasitological examination at the Grand Marché market

Species	**Total parasites number**	**Group**	**Stage**	**Prevalence (%)**
Rhabditis sp	5x7= 35	Nematodes	larvae	33,1
Harpacticoida sp	4x7= 28	Copepods	larvae	25,6
Strongyloides sp	5x7= 35	Nematodes	larvae	33,1
Strongyloides sp	3x7= 21	Nematodes	eggs	22,9
TOTAL	**109**			**100**

At the Grand Marché market, we identified an average of 35 larvae of Rhabditis sp, is about a prevalence of 33.1%, 28 larvae of copepods of the species Harpacticoida sp with a prevalence of 25.6%, 35 larvae of Strongyloides sp, is about a prevalence of 33.1% and 21 eggs of Strongyloides sp. The prevalence of nematodes which is 84.4% is much higher than the prevalence of copepods which is only 25.6%. Strongyloides sp remains the most prevalent species at the Grand Marché market (Table II and Figure 3).

Vol. 07, No. 04; 2022

ISSN: 2456-8643

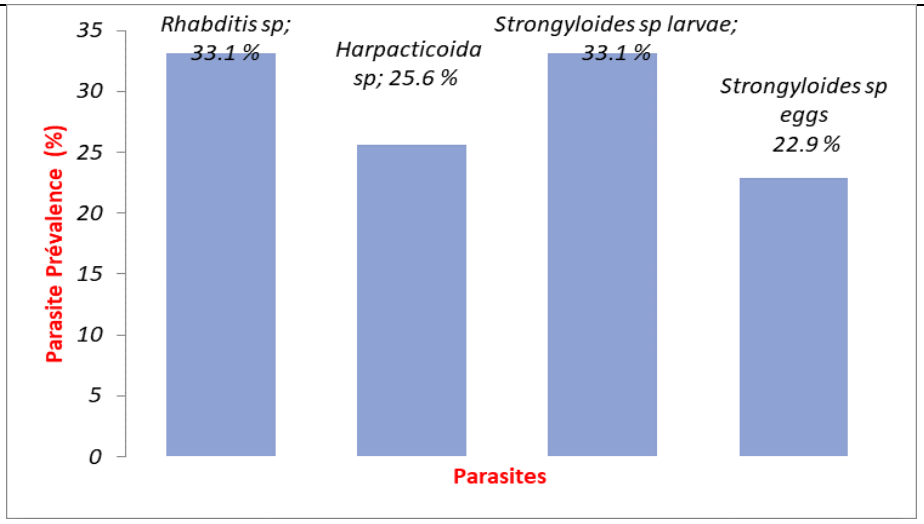

Figure 3: Prevalence of parasites encountered at the Grand Marché market

Table III: Results of the parasitological examination at the Orly market

Species	Total parasites number	Group	Stage	Prevalence (%)
Rhabditis sp	5x7 = 35	Nematodes	larvae	31,2
Harpacticoida sp	3x7 = 21	Copepods	larvae	18,7
Strongyloides sp	6x7 = 42	Nematodes	larvae	37,6
Strongyloides sp	2x7= 14	Nematodes	eggs	12,5
TOTAL	**112**			**100**

Vol. 07, No. 04; 2022

ISSN: 2456-8643

At the Orly market, we identified an average of 35 Rhabditis sp larvae, is about a prevalence of 31.2%. 21 copepod larvae of the species Harpacticoida sp, is about a prevalence of 18.7%, 42 larvae of Strongyloides sp, is about a prevalence of 37.6% and 14 eggs of Strongyloides sp, is about a prevalence o 12.5%. The prevalence of nematodes is much higher than that of copepods which are respectively 81.3% and 18.7% (Table III and Figure 4).

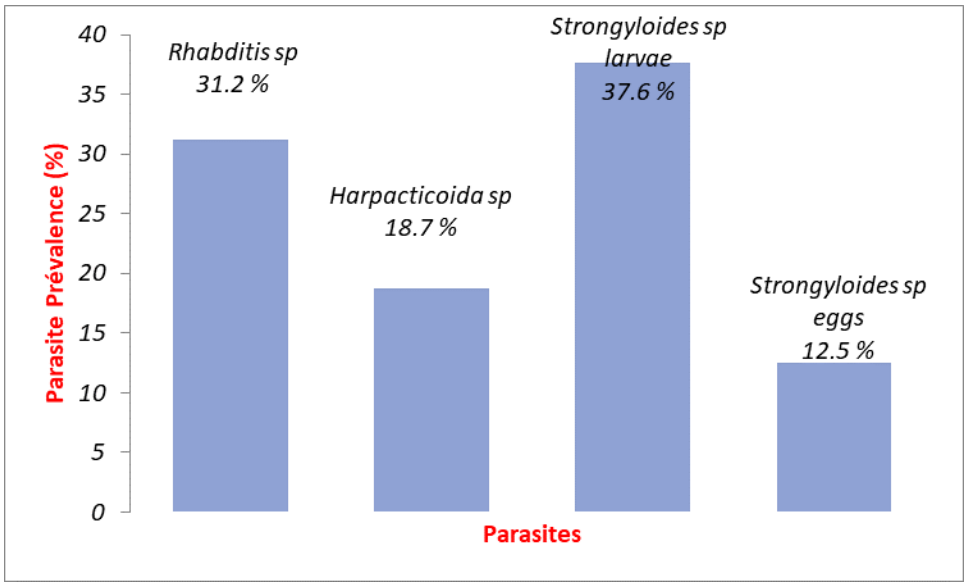

Figure 4: Prevalence of parasites encountered at the Orly market

Table IV: Cumulative results of the parasitological examination of snails from the three study sites

Species	Total parasites number	Group	Stage	Prevalence (%)
Rhabditis sp	98	Nematodes	larvae	31,1
Harpacticoida sp	63	Copepods	larvae	20
Strongyloides sp	119	Nematodes	larvae	37,8

Vol. 07, No. 04; 2022

ISSN: 2456-8643

Strongyloides sp	35	Nematodes	eggs	11,1
TOTAL	**315**			**100**

On all these three markets, we obtained 98 Rhabditis sp larvae with a prevalence of 31.1%.

63 larvae of Harpacticoida sp with a prevalence of 20%, 119 larvae of Strongyloides sp with a prevalence of 37.8% and 35 eggs of Strongyloides sp with a prevalence of 11.1%. The prevalence of Nematodes in the three markets is 80% and that of Copepods is 20% (Table IV and Figure 5).

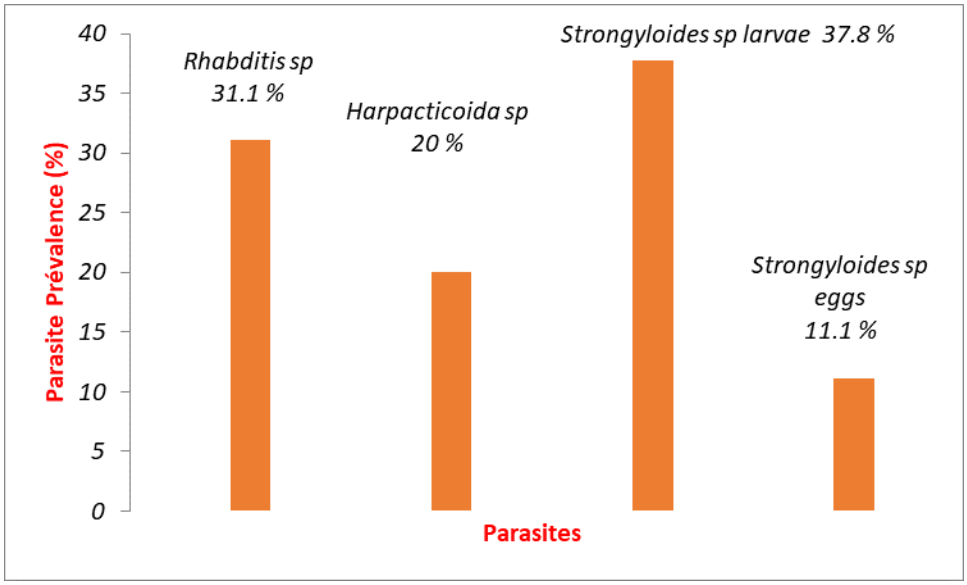

Figure 5: Average prevalence of parasites encountered in the three markets

6.DISCUSSION

The results of this study indicate that the giant African land snails Achatina achatina examined during our study contained eggs, larvae of nematodes and copepods in their faeces. Many species of snails can serve as intermediate or definitive hosts for the parasites (Caro TM (1981), Gerichter CB (1949)).

These results agree with those of Deng et *al.* (2010), Chikweto *et al.*, 2009, Foronda *et al.*, 2010, Zhang *et al*. (2008), Lv *et al.*, 2009, Thiengo *et al.*, 2010, Harinasuta (1965). They indicated that R. rattus and gastropods are respectively the definitive host and the intermediate host of A. Cantonensis and Rhabditis sp. The results obtained in these different studies revealed a high prevalence of Nematode larvae in Achatina achatina snails.

In addition, the high prevalence of worms in land snails, an intermediate host, indicates that snails are often infected and therefore the host-parasite relationship should be studied more often

Vol. 07, No. 04; 2022

ISSN: 2456-8643

and infection with these parasites should be investigated. special attention to Daloa. Because larvae have been isolated from human stool, urine and vaginal swabs. Gianelli *et al.* 2014.

Feng & Li (2014) described two cases of urinary tract infection in humans in China, and Ahn *et al.*, (2019) reported five human cases of intestinal Rhabditis sp infection in rural school children in South Korea with fever and watery symptoms, bloody diarrhea; Stool examination revealed the presence of eggs, larvae and adult Rhabditis sp.

In general, Rhabditis sp is considered a common cause of otitis externa in cattle living in tropical regions (e.g., South America and Africa), particularly in older animals, and has also been identified in chickens, dogs and pigs with intractable diarrhea Ng TP *et al*. (2013), Barquante *et al.* (2003).

We can deduce from these results that there could be a health risk linked to the consumption of snails. Further large-scale epidemiological studies will help identify risk factors associated with the spread of the consequences of snails consumption should be conducted.

Further studies are needed to assess the interactions between humans and parasites in order to paint a more complete picture of the influence of the host species on the epidemiology of these lungworms, as has already been done for schistosomiasis. (Adema CM *et al.* 2012).

Nevertheless, based on the results documented here, the existence of competitive exclusion between worms from the same intermediate host cannot be ruled out. Therefore, it is important to identify other routes of parasite transmission, particularly as the geographic range of gastropod-borne diseases is expanding.

7.CONCLUSION

We identified 98 Rhabditis sp larvae, a prevalence of 31.1%. 63 larvae of Harpacticoida sp a prevalence of 20% and 154 larvae and eggs of Strongyloides sp a prevalence of 48.9%. The prevalence of Nematodes on the three markets is 80% and that of Copepods is 20% on all the three markets.

This indicates that the giant African snails could serve as a reservoir for several Nematodes. Giant African snails are among the most commonly eaten species and often live close to humans. Accordingly, contamination of the domestic environment by feces is possible, giant African snails should always be considered as potential carriers of nematodes capable of causing opportunistic diseases in humans.

Therefore, we emphasize the importance of further epidemiological research on the presence of free-living and parasitic nematodes in gastropods kept in captivity, and emphasize the need for strict control measures to reduce the risk of opportunistic nematode infection in pet snails traders or snails breeders.

REFERENCES

Adema C.M., Bayne C.J., Bridger J.M., Knight M. (2012). Will all scientists working on snail and the diseases they transmit please stand up, Université de Tlemcen. p200.

Adeyeye I. E. (1996). Waste yield, proximate and mineral composition of three differents types of land snails found in Nigeria. Inter. J. Food Sci. Nutr. 47: 111.

Ahn Y., Yao C., Wen Y., Feng Y. (2019). Full length microwave induced surface enhance pollutant adsorption and photocatalytic degradation on ag/tio2. journal of applied surface science 483(3)772-778.

Agbogidi O.M., Okonta B.C., Ezeana E.L. (2008). Effects of two edible fruits on the growth performance of african giant land snail (*Archachatina marginata*). *Journal agriculture and biological science issn* : 23,(1) :1990-6145.

Barçante TA, Barçante JM, Dias SR, Lima Wdos S. (2003). **E**mergence of third-stage larvae from infected Biomphalaria glabrata snails. Parasitol Res, 91(6):471-475 fonctions of trail-following in gastropods.biol journal camb philos soc 88(7) : 683-700.

Beugnet F., Polack B., Dang H. (2004) Atlas de coproscopie. Tome II: technique de coproscopie. Ed. Kalianxis Masson, Paris (France),154p

Cobbinah J.C., Fondation Agromisa,wageningen (2008). L'élevage d'escargots production, transformation et commercialisation Isb.agromisa : Edition IRD Paris (France) 109P

Caro T.M. (1981). Sex differences in the termination of social play in cats, author links open overlay panel. *Journal animal behaviour*, 29(1), 271-279

Chikweto A., Bhaiyat M.I., Macpherson C.N., Pinckney C.R., Chards R.N (2009). Existence of *Angiotrongylus cantonensis* in rattus norvegicus) in Grenada. *Veterinary parasitology*, 162, (1-2) 160-162.

Deng (2010). Adsorption and desorption behaviors of lignosulfonate during the self-assembly of multilayers, Yonghong Deng Yuan Wu, Ong Qian Xinping Dongjie Yang. *bioresourc journal.com* 5, (2) 1930-2126.

Feng & Li. (2014). Microbiota and the gut-liver axis: bacterial translocation, inflammation and infection in cirrhosis. Journal of gastroenterology 7(2-3) 16795- 16810.

Foronda G., Jordi M., Jordi T., Matiasse G,Santiago M., Maria D (2010). Finding of *Parastrongylus cantonensis* (Chen 1935) in *Rattus rattus* in Tenerife, canary island (Spain). *Journal acta tropica*, 114, (2), 123-127

Giannelli, R.A. Ramos, G. Annoscia, A. Di Cesare, V. Colella, E. Brianti, F. Dantas-Torres, Y. Mutafchiev, D. Otranto. (2014). Development of the feline lungworms *Aelurostrongylus abstrusus* and *Troglostrongylus brevior* in Helix aspersa snails. *Parasitology*, 141, pp. 563-569

Gerichter CH.B. (1949). Studies on the nematodes parasitic in the lungs of felidae in Palestin. *Journal of animal & plant sciences* 39, (3-4).251-262.

Gordon B.V., Whitlock V.V. (1939). A new method for conting nematode eggs in sheep faeces. *Journal of the council for scientific for industral research* 1(4),193-209.

Harinasuta.C., Kruatrachue M., Sornmanni S. (1965). A survey of helminth infection in rat (*Rattus rattus sp*) from Chiang Mai Moat. *Journal of tropical medicine and hygiene* 1965. (68) 125-127.

Igbinosa E.O., Beshiru A., Akporehe L.U., Ogofure A.G. (2016). Detection of methicillin-resistant staphylococci isolated from food producing animals: A public health implication. *Vet. Sci.*;3 :1–11.

Iwanowicz, D. D., Sanders, L. R., Schill, W. B., Xayavong, M. V., Da Silva, A. J., Qvarnstrom, Y. and Smith, T. (2015). Spread of the rat lung worm (*Angiostrongylus cantonensis*) in giant

African land snails (*Lissachatina fulica*) in Florida, USA. *Journal of Wildlife Diseases* 51, 749–753.

Karamoko M., Akesse E., Adou C.F., Kouato F., Otchoumou A. (2016). Reproduction de la seiche commune *Sepia officinalis* (Linneus,1758) de la zone économique et exclusive de Côte d'Ivoire. *International journal of innovation and applied studies:* 132 (2) 522-530.

Koffi K.E., Saraka N.D., et Dosso M. (2019). Etude bactériologique des escargots géants africains en Côte d'Ivoire. *Journal of animal &plant sciences*, 39, (3-4) :6394-6402

Koffie-Bikpo C.Y & Kra K.S. (2013). La région du Haut-Sassandra dans la distribution de produits vivriers agricoles en Côte d'Ivoire. *Journal. geo. trop. environ* 20 (13) 389-399.

Kouassi K.D., Otchoumou A. & Dosso H. (2007). Les escargots comestibles de Côte d'Ivoire: influence de substrats d'élevage sur les paramètres de croissance de *Archachatina ventricosa* (Gould, 1850) en élevage hors-sol. *Tropicultura*, 2007, 25, 1, 16-20

Lv L.T., Sornman A.E., Motta F.S (2009). The Schistosoma japonicum genome reveals features of host-parasite interplay. Nature 20 (56): 345-351

NGT.P., Saltin.S.H., Johannesson.M.S., Stafford.R (2013) snails and their trails: the multiple fonctions of trail- following in gastropods. *Biol journal camb philos soc* 88(7) : 683-700.

Otchoumou A., (1997). Etude de trois espèces d'escargots comestibles de forêts hygrophiles humides de l'est de la Côte d'Ivoire *Achatina achatina* (Linné), *Achatina fulica* (Bowdich) et *Archachatina marginata* (Swainson) variété ventricosa: reproduction et croissance en milieu naturel et en élevage. Thèse de Doctorat de 3e cycle Université de Cocody- Abidjan, 110 p.

Otchoumou, A., Dupont-Nivet, Mathilde, L, Anin, Dosso Henri (2007) Effects of photoperiod on growth and reproduction in *Archachatina ventricosa* (Gould, 1850) under indoor rearing conditions. *Invertebrate Reproduction and Development* 50(2):109-115

Reece, R. L., Perry, R. A. and Spratt, D. M. (2013). Neuroangiostrongyliasis due to *Angiostrongylus cantonensis* in gang-gang cockatoos (*Callocephalon fimbriatum*). *Australian Veterinary Journal* (91), 477–481

Thiengo.G.J., Zilene.M.F., Simoné.T.O. (2010) first report of Angiostrongylus contonensis (nematoda : metastrongylidae) in Achatina fulica (mollusca :gasteropoda) from southeast and south Brasil. journal memorias do instituto oswaldo cruz. 105, (7) : 0074-0276.

Zhang, Si-Ming, Zeng, Y., & Loker, E. S. (2008). Expression profiling and binding properties of fibrinogen-related proteins (FREPs), plasma proteins from the schistosome snail host 208 Biomphalaria glabrata. Innate Immunity, 14(3), 175–189.