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Original article

PREVENTION OF DISEASES TRANSMITTED BY THE GIANT AFRICAN SNAIL. A NARRATIVE REVIEW OF THE LITERATURE.

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Abstract.

Background:

The African Giant Snail is considered one of the 100 species most harmful and exotic invaders in the world.

Methodology:

A bibliographic review was carried out in January 2021. References were searched in Pubmed, Medline, and Scelo databases. The Google Scholar search engine was used. The keywords: "communicable diseases", "Achatina fulica", "African giant snail", "exotic invader species", "prevention", and "communicable diseases", were used in the search strategy. Relevant literature or articles recently in English, Spanish, or Portuguese in full text were considered as selection criteria. The analysis of quality, reliability, and methodological validity of the chosen articles allowed us to carry out an adequate review and the selection of 26 bibliographic sources.

Results:

The Achatina fulica measures up to 30 cm. It is an oviparous hermaphrodite and deposits 100 to 200 eggs the first year and then between 500 and 1200. It has a brownish-black body and a reddish-brown conical shell with vertical lines. It serves as an intermediate host of parasites, bacteria, viruses, and fungi that cause illnesses in humans. The main control measures include the prevention of contact and the mechanical destruction of this vector.

Conclusion:

African Giant snail, disseminated to almost all the tropical regions of the world, produces big damage to agriculture, the flora, the fauna, and human health; the most effective method for its control is the manual gathering of the snail and its eggs for its later destruction, however, most of the population ignores the appropriate forms the eradication and it maintains a low perception of risk.

Recommendation:

This article sought to offer summarized information and recent that allows the medical students to identify the African giant snail and to carry out promotion actions and prevention in the communities that serve them as educational scenarios.

Keywords: communicable diseases, prevention, Achatina fulica, African giant snail, exotic invader species, Submitted: 2023-08-06 Accepted: 2023-08-16

1. BACKGROUND TO THE STUDY.

The Achatina fulica, known as the Giant African Snail, taxonomically comes from the

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kingdom: animal, phylum: Mollusca, class: gastropoda, subclass: Pulmonada, order: Stylommatophor, suborder: Sigmurethra, superfamily: Achatinoidea, family: Achatinidae, genus: Achatina, species fulica, synonym: Lissachatina fulica.1

This Giant African Snail is considered one of the most harmful pests due to its high resistance to environmental variables, polyphagous diet, and high reproductive potential. These qualities favor its dispersal, making it a threat to more than 200 types of ornamental and forestry crop foods and causing great damage not only to agriculture but also to flora and fauna; reasons why the International Union for Conservation of Nature has considered it one of the 100 most harmful invasive alien species in the world.2-3

Its main health risk results from the possibility of acting as a carrier of parasites that produce diseases that can be fatal, such as eosinophilic meningoencephalitis and strongyloidiasis, among others.3-4

The study carried out by medical students in the presence of Achatina fulica for the first time in Cuba, in Regla municipality, in Havana, concludes that the risk of getting sick is known; but the majority of the population surveyed is unaware of the appropriate ways to eradicate it.5 Taking into account the knowledge acquired in the subject, Community Medicine, to be applied in education at work, this research is carried out to describe the main characteristics of this mollusk that make it a risk to human health and the main measures that medical students can promote for its control.

2. METHODOLOGY.

A bibliographic narrative review was carried out in January 2021. References were searched in the Pubmed, Medline, and Scielo databases. in the Virtual Library of Health of Infomed and the Google Scholar search engine was used.

The keywords: " Lissachatina fulica ", "Achatina fulica", "African giant snail", "exotic invader species", "prevention", "communicable diseases", and their English equivalents were used in the search strategy. applied for the recovery of the information, as well as the literature of available consultation in the repositorio of Cuban authors' books and the virtual library of the Health of Informed (http://www.bvscuba.sld.cu/).

It was considered selection criteria, that literature published recently or that it was relevant documents considered in the thematic one, materials that were in English, Spanish language, or Portuguese, and those that it was possible to recover the complete text.

The analysis of quality, reliability, and methodological validity of the chosen articles allowed us to carry out an adequate review and the selection of 26 bibliographic sources.

3. RESULTS.

Achatina fulica is a species of snail that measures from 10 to 30 cm in total length, It is an oviparous hermaphrodite with cross-fertilization, and mating lasts from 3 to 6 hours; but it can last up to 24 hours.6-8 However, they do not self-fertilize but need another snail of their species to mate. The Giant African Snail does not mate at random; snails mate based on the age and size of other snails. Snails that choose their mates concerning size are reproductively dependent on a more attractive mate. When two individual snails of approximately the same size mate, there is a chance that the gametes will be transferred to each other at the same time; but if there is a difference in size, the larger snail will act as the female and gametes will only be transferred from the smaller snail to the larger snail in a one-sided mating. 8

After copulation, Achatina fulica can store sperm, guaranteeing several eggs being laid with a single mating, with 5-6 months of life it is already fertile, and from its first laying, it deposits 100 to 200 eggs, in the second year, it even exceeds 500 eggs between 900 and 1,200 eggs per year have been recorded. Snails lay their eggs in cool, wet soil and under objects. 6-8

In the tropics, eggs generally hatch at temperatures above fifteen degrees Celsius after 11-15 days. Juvenile stages eat their eggshells before

foraging for other food, such as unhatched eggs and organic debris. They bury themselves and remain hidden for 5-15 days. The eggs hatch into immature snails, which grow to adulthood in about six months, without going through a larval stage. Achatina fúlica has an average longevity of 4.5 years, although in captivity it has an estimated 7 to 10 years of life. 6-8

A study carried out in a banana production and marketing cooperative in Ecuador describes the average weight of the Giant African Snail from 13.88 to 19.39 grams, the diameter from 2.63 to 3.36 cm, and the average length from 4.58 to 6.13 cm. Varying in the different regions of the cooperative according to environmental conditions, presenting bigger and heavier snails in zones with higher humidity. 7

The Giant African Snail is a cold-blooded gastropod invertebrate made up of two parts: the shell and the body. The body is moderate brownish-black with moist skin. This species also has a caudal tentacle; the upper pair of tentacles have eyes at the tips, and the lower pair has a sensory organ that allows scent. The shell is conical in shape, in its juvenile state it is thinner, translucent, and fragile; but in adulthood, it is thicker and opaque with high calcium content, it has a reddish-brown color with slightly yellow or light brown vertical stripes that lighten towards the apex; varying due to weather conditions and their diet. The columella is white or bluish-white, like the parietal calluses. 1,2,7

The skin layer contains the glands that secrete mucus, commonly called "slime" with protective lubricating functions of hydrophilic power that facilitates movement and serves to detect its presence. 1

The rhythm of activity of the Giant African Snail can vary according to environmental conditions, so it will depend on humidity and temperature. They are nocturnal and in extreme cases, they hibernate or aestivate for long periods at an estimated depth between 100 and 125 mm. 1,6-9

Achatina fulica consumes at least 500 different types of plants, algae, and lichens, it also eats bones and decomposing organic matter, fecal feces, and even limestone rocks and walls in search of calcium sources. Despite being a tropical species, it survives in adverse conditions .1,7-9

Originally from Africa, where it is widely disseminated, this mollusk has been transported to almost all tropical areas of the world, becoming an invasive species that displaces others and destroys ecosystems. This is because it can establish itself and advance spontaneously in the new environments in which it is introduced, with the potential ability to displace populations of native snails in the region by competing for the same habitat and food due to its particular characteristics such as its voracious feeding behavior, high reproductive potential, accelerated body growth, and great resistance to adverse environmental conditions. These features give it advantages over native snails, especially when it has no natural enemies except for the hook-billed hawk (Chondrohierax uncinatus uncinatus) which feeds on snails and eventually frogs, lizards, birds, and invertebrates.10

The Achatina fulica is not a migratory species, it is introduced into Asia, Oceania, and America mainly through illegal trade for religious, therapeutic reasons, as food, as an exotic pet, or through the sale of plants where snails or their eggs can lodging and other accidental and intentional ways. In Cuba, the introduction of this species was reported in January 2014 and its dissemination is described as the starting point of its detection in the surroundings of the Poey neighborhood of the Arroyo Naranjo municipality, Havana province, where it was used for Yoruba religious practices. 5.11

Cuba has been almost the last country in the American continent where the species has been introduced since its existence has been known for years in South America and Central America, places where it is even eaten and there are continuous reports of contagion of diseases, however, it is present in 13 provinces of the island.11-13

3.1. Giant African Snail (Achatina fulica). Risks to human health.

Eosinophilic meningoencephalitis is a disease characterized by an inflammatory response of the central nervous system in the presence

of Angiostrongylus cantonensis larvae, causing meningeal manifestations and, in severe cases, neurological dysfunction leading to coma and death. 14.15

Among the intermediate hosts of Angiostrongylus cantonensis, the nematode that causes Eosinophilic Meningoencephalitis in humans, are most of the Cuban autochthonous mollusk species such as Eutudorajimenoi, Chondropomapictumarangoi, Tetrentodon (Tetrentodon) perdidoensis, Tetrentodon (Scalaricoptis), Zachrysiaauricoma, Emodasagraiana, Viana regina, Jeanneretiabicincta, Polymita picta, Pomacea paludosa, Helisomaduryi, Crassostraearizophorae; but Achatina fulica is considered the main vector of this parasite in the world since its large size favors a greater number of Angiostrongylus cantonensis larvae. 11-15

In addition, the Giant African snail is a host to other infectious agents that affect human health such as Angiostrongylus costaricensis, Schistosoma mansoni, Aelurostrongyl usabstrusus, Angiostrongylus vasorum, Troglostrongylus brevior, Crenosoma vulpis, Fasciola hepatica, Giardia lamblia, Blastocystis hominis, Cryptosporidium parvum, Trichuris sp, Hymenolepis sp, Strongyloides sp, bacteria such as Aeromona hydrophila, viruses and pathogenic fungi. 2,6,13-23

Human beings have been responsible for the dissemination of the Giant African Snail throughout the world and with it, the loss of native flora and fauna species was provoked, in addition to the great damage generated to agriculture and the health of his peers. From education at work, medical students can promote the necessary measures for the control of Achatina fulica in communities.

3.2. Measures for the control of the intermediate host Achatina fulica.

When the measures recommended for the eradication of the main intermediate host of the Angiostrongylus cantonensis parasite are not met, the risk of dissemination of the mollusk increases, and consequently the risk of occurrence of eosinophilic meningoencephalitis 12-14,24-25.

It is necessary that the entire population, in addition to knowing how to identify the Giant African Snail and notify the health professionals immediately, know that within the actions to combat or eradicate it, there are agro-technical measures, mechanical, chemical, and physical control, among other methods for its elimination. The most effective method of control is the manual collection of snails and their eggs for their subsequent destruction.1 From education at work, students must be able to guide the following measures 8,26 in the health areas they visit:

1. Do not play with the giant African snail
2. Never keep these snails as pets, bait, or decorations
3. Do not move snails to other areas
4. Do not use the Giant African Snail in religious rites
5. Avoid contact with this mollusk, mainly with the mucus that it secretes (drool) and feces, and in case of contact, wash your hands immediately with soap and water.
6. Immediate hand washing with soap and water in case of touching surfaces that may have been in contact with snail slime.
7. Never eat the captured mollusks, nor breed them
8. Do not throw these snails into the river or other water sources where the propagation of different larval stages of the parasites they host is facilitated.
9. To capture them, use impermeable gloves or plastic bags, face masks, and boots to protect yourself from direct contact with their slime.
10. Do not allow children to participate in the capture and destruction of snails
11. The best time to capture the mollusks is at twilight and on cloudy and rainy days since that is when they come out in greater numbers from their shelters.
12. Another method of capture is the use of experimental traps that have a bait or attractant for the snail (tropical fruits such as banana or mango) in a small container, which in turn must be placed in the center of another larger container. Common salt is placed between it and the container with the bait,

which will serve as a dehydrating floor for the mollusks when they head toward the center of the trap in search of the attractant, thus causing their death. It is advisable to cover the trap to protect its essential components from the action of the sun and rain. The snails captured in the traps must be removed using impermeable gloves for their subsequent destruction.

13. Do not throw away the snails without killing the mollusks directly in the trash
14. To destroy them, do not crush them, place the found mollusks in a bucket with water and plenty of common salt (NaCl) or lime (83 tablespoons per liter of water), until they stop moving (preferably 24 hours). Afterward, break the shells so that rainwater does not settle on them, then burn, bury, or place them in the trash.
15. The eggs of the small mollusks are hard and light in color and to destroy them they must be boiled in water before placing them in the garbage.
16. Gloves used for collection should also be burned or buried
17. Not only giant snails can represent risks, but there are other species of mollusks including garden snails that can also be hosts for Angiostrongyliasis, so one should avoid touching them with your hands, especially in environments with rodents.
18. Before consuming vegetables, it is recommended to carefully wash them and disinfect all the leaves that will be eaten raw with a chlorinated solution.
19. Be careful when moving plants or other household items where snails or their eggs could be staying.
20. Avoid throwing garbage in quintals, gardens, and lots
21. Keep weeded and free of remains of wood, tiles, bricks, or other objects that can be used as refuges by the snail in the quintals, gardens, and lots.
22. As for the final disposal of the collected snails —alive or dead—, they must be incinerated, submerged in boiling water, or buried in areas far from water supply sources, rivers, lagoons and streams, or groundwater below depths eight meters. The burial pit must be dug in the form of a slope and its depth must be such that it allows the animals to be completely covered with at least one meter of earth.
23. In the event of any doubt, the population will be directed to attend the Medical Office or the Polyclinic to report the presence of the invasive species.

4. CONCLUSION.

African Giant snail, disseminated to almost all the tropical regions of the world, produces big damage to agriculture, the flora, the fauna, and human health; it is considered that the most effective method for its control is the manual gathering of the snail and its eggs for its later destruction, however, most of the population ignores the appropriate forms the eradication and it maintains a low perception of risk.

5. RECOMMENDATION.

This article sought to offer summarized information and recent that allows the medical students to identify the African giant snail and to carry out promotion actions and prevention in the communities that serve them as educational scenarios.

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7. LIST OF ABBREVIATIONS.

cm: centimeters
mm: millimeters

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