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Perception of giant African snail (*Achatina fulica*) in urban community from Colombia

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Percepción del caracol gigante africano (*Achatina fulica*) en una comunidad urbana de Colombia

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ABSTRACT

In Colombia, the control of giant African snail populations (*Achatina fulica*) has been enforced for the past eight years according to the Environmental, Housing, and Territorial Development Ministry (MAVDT from its initials in Spanish). During this period, the environmental authorities have carried out a series of campaigns for snail eradication and to raise awareness in the general community to involve it in the control of this invasive species. In order to inquire about the perception of the citizens of Cali, Colombia, have of the giant African snail and their role as primary stakeholders in the local control programs, a structured survey was done, and the dependency on the sociodemographic characteristics was established through Fisher's exact test. 316 people took part in the survey; over 80% of the individuals recognized the giant African snail and their form of control, but over 90% of them did not participate in the control campaigns. The perception of the giant African snail varied noticeably with the respondents' age and was independent of socio-economic and educational level. In conclusion, it was detected a solid dissociation between people and the actions carried out by the environmental authority. It is recommended to take into account people's concept of invasive species control in other cities as a fundamental instrument in the construction of a more dynamic and inclusive control model.

Keywords:
Control
Human dimension
Invasive species
Stakeholder

RESUMEN

En Colombia, el control de las poblaciones del caracol gigante africano (*Achatina fulica*) lleva ocho años de vigencia de acuerdo con el Ministerio de Ambiente, Vivienda y Desarrollo Territorial (MAVDT). Durante este tiempo, las autoridades ambientales han realizado una serie de jornadas de erradicación del caracol y concientización de la comunidad para involucrarla en el control de esta especie invasora. Con el fin de indagar en la percepción de los ciudadanos de Cali, Colombia, sobre el caracol gigante africano y su rol como actor principal en los programas de control local, se construyó una encuesta estructurada y se estableció la dependencia de las características sociodemográficas mediante la prueba exacta de Fisher. Participaron 316 personas en total; más del 80% de los individuos reconocen al caracol gigante africano y la forma de control, pero más del 90% no participa en las jornadas de erradicación. La percepción del caracol gigante africano cambió notablemente con la edad de los encuestados y es independiente del nivel socioeconómico y educativo. En conclusión, se detectó una fuerte disociación entre las personas y las acciones que realiza la autoridad ambiental. Se recomienda tener en cuenta el concepto de las personas en el control de otras especies invasoras en otras ciudades como un instrumento fundamental en la construcción de un modelo de control más dinámico y participativo.

Palabras clave:
Control
Dimensión humana
Especie invasora
Actor social

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A stakeholder is any individual, group or organization who is affected (positively or negatively) by invasive species, or who has the capacity to promote or limit the invasive species expansion, and its role in the management and control programs would be a crucial factor to reduce the effect of invasive species (Shackleton *et al*., 2018). In Colombia, the giant African snail (*Achatina fulica,* Bowdich 1822) was included in the list of exotics species (MAVDT, 2008), and in an international scenario is considered one of the most dangerous exotic invasive species in the world (Lowe *et al.,* 2000; de la Ossa *et al.,* 2017). *A. fulica* is a native snail from Eastern Africa; from where, it has spread over large part of the world's tropical region during the past two centuries, bringing negative consequences to ecosystems, economies, and public health (Raut and Barker, 2002; Thiengo *et al.,* 2007; de la Ossa *et al.,* 2017; Córdoba *et al.,* 2017; Patiño and Giraldo, 2017). In countries such as the United States, native species have been displaced by competition with *Achatina fulica* (Roda *et al.,* 2016). The species is widely known due to the damage it produces to crops in Ecuador, and the worldwide dispersion of the nematode, *Angiostrongylus cantonensis*, from China is attributed to the giant African snail (Castaño and García, 2014; Peng *et al.,* 2017).

Due to the high economic and environmental costs attributed to the giant African snail, different control strategies have been adopted (da Silva and Marques, 2017). These strategies have been classified into three main groups: physical, chemical, and biological. Unfortunately, all the control and eradication strategies implemented to stop the giant African snail expansion have not been able to contain it (Correoso, 2006; Garcés *et al.,* 2016; Patiño, 2018; Smith *et al*., 2013; Thiengo *et al*., 2007). For this reason, the concept of eradication in the action plan against giant African snail was replaced by the concept of management, and new strategies using a combination of alternative methods of control have emerged, local scientific studies about the snail natural history and direct interaction with the stakeholders, were designed in order to reduce the negative impact of this species (Balfour and Alli, 2014).

According to the invasive species definition adopted by the International Union for Conservation of Nature (IUCN), people are a key factor in distribution, establishment, and success of foreign species in ecosystems (Lowe *et al.,* 2000; Pereyra, 2016). Therefore, the management of any invasive species requires the correct articulation of the different sectors or "actors" of the affected community. In general, the community's perception about the giant African snail would be determined by the education level of the inhabitants, the intensity of the divulgation campaigns, the direction of the campaigns towards biological knowledge or control methods, and the impact that the mollusks have in their daily lives, among others (Rout *et al.,* 2014; Andreazzi *et al.,* 2017). Moreover, the active participation of stakeholders in the local management plans could reduce the amount of money invested to control this invasive species (Crowley *et al.,* 2017a, 2017b).

In Colombia, a regulatory ordinance for this snail control just was signed in 2011, by that year its presence had already been reported in ten departments of the country. This ordinance set the responsibilities and obligations that the regional and municipal environmental authorities had to implement (MAVDT, 2011; Giraldo *et al*., 2014). During the last ten years, *A. fulica* has been considered an invasive species in Colombia, the Regional Autonomous Corporations (CARs by its initials in Spanish) have developed control activities, financed scientific research, and carried out public citizen warning activities on the giant African snail in their respective regions (Garcés *et al*., 2016; Córdoba *et al.,* 2017; de la Ossa *et al.,* 2017).

Valle del Cauca is the department of Colombia where the greatest amount of research on the giant African snail encompassed the ecology, genetics, parasitology, and alternative control methods of the species have been conducted, followed by the departments of Sucre, Antioquia, and Santander. However, it has been widely suggested that the giant African snail problem has not yet been contained in these region (Giraldo *et al.,* 2014; Garcés *et al.,* 2016; de la Ossa *et al*., 2017; Patiño and Giraldo, 2017; Varela *et al*., 2017). For example, in the biggest urban center of Valle del Cauca, the city of Cali, the environmental authority started a giant African snail control campaign based in manual recollection since 2012. Despite this huge effort, the population of

A. fulica continue latent. Therefore, to evaluate the role of the people who live in Cali as a key stakeholder in the local control program, it was evaluated their perception about the giant African snail under the assumption that the public warning campaigns have effectively reached all sectors of the city and the results were contrasted with other similar studies on this species (Moreira *et al.,* 2012; Luizaga *et al.,* 2015; Sá *et al.,* 2016; Andreazzi *et al*., 2017).

MATERIALS AND METHODS

Studied area

The city of Cali is located in the southwest of Colombia. It is the administrative and financial center of the department of Valle del Cauca and one of the largest cities in Colombia with a population of around 2.5 million and a density of 51 homes per hectare. The urban area is divided administratively into 22 communes that encompass 248 neighborhoods (Alcaldía de Santiago de Cali, 2018) (Figure 1).

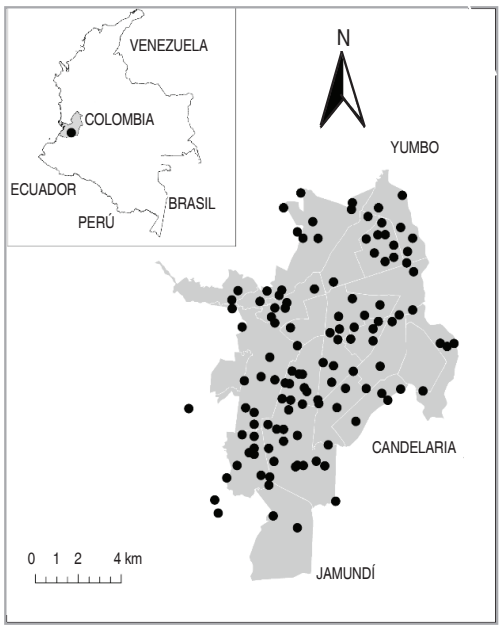

Figure 1. Studied area of Cali's urban zone and its administrative division by communes. Black points represent the respondents' location.

Designed questionnaire

A questionnaire was designed to collect information through a structured survey following the recommendations of García *et al.* (2008), Sá *et al.* (2016) and Andreazzi *et al.* (2017). The questionnaire had three sections; the first section contained questions related to socio-demographic characteristics such as home location, age, socio-economic stratum, and education level. The second section contained general questions on the invasive species, such as the concept of the species, negative consequences of its presence, the subject broadcasting, and environmental authorities in charge of dealing with the invasive species. The last section encompassed general information on the giant African snail, such as how to identify it, negative consequences of its presence, knowledge associated with parasites, control measures, participation in control efforts, and how the environmental authority efforts were perceived.

The questionnaire consisted of 23 open-ended and multiple-choice questions. The multiple-choice questions used language categories such as "Yes or No" or a scale of 1 to 10, where 1 was the minimum score and 10 the maximum score. The questionnaire was designed using a virtual application for its later broadcasting using digital and printed media. The statistical universe considered for census accuracy estimation was the population of Cali, and only one questionnaire per person was recorded. For the digital broadcasting, the electronic address of the questionnaire was divulged on social media and by email between July 2017 and February 2018, reaching 1,200 people. The following criteria were used to stop receiving

questionnaire responses: (i) Obtaining the desired statistical sample, 385 answered surveys considering physical and digital broadcasting, corresponding to a 95% confidence level and 5% error, (ii) total coverage of the communities in the Cali's urban area, (iii) the distribution of surveys by neighborhoods in Cali, and (iv) the number of days without replies or with only one reply to digital questionnaires.

Statistical analysis

Responses to questionnaires were organized in a database, similar to a presence-absence matrix, discriminating each question and answers, with one corresponding to an answer to the question and zero for the other options. The geographic coordinates of respondents' homes were obtained manually with Google Earth® program; age was grouped in categories of 14 to 20, 21 to 30, 31 to 40, 41 to 50, and 50 and above. For giant African snail locations, the categories of habitat (green area, water sources, median strips, among others) and the percentage of each type were calculated considering the number of people reporting this species. The questions with responses from one to ten were grouped into three categories as follows: "low" when the answer ranged from one to three, "medium" when the answer ranged from four to seven, and "high" when the answer ranged from eight to ten. The general trend of perception variables was evaluated descriptively, and its dependency on socio-demographic characteristics was evaluated with a contingency analysis using Fisher's exact test in the STATA program version 14.

RESULTS AND DISCUSSION

A total of 316 surveys were processed, covering 137 neighborhoods of Cali's 21 communes. Fifty-seven percent of participants were from medium socio-economic level, 33% were from low, and less than 20% were from high. Most participants were female (57.6%) ranging in age from 21 to 30 years old (34.5%). There were responses from people ranging an education level from primary school to postgraduate studies, with an equal number of participants from public and private institutions. One of the main problems with invasive species management is that it usually focuses on administrative-economic costs and available scientific knowledge on the species and neglects the social context (García *et al.,* 2008; Crowley *et al.,* 2017b). The heterogeneity of the community sharing space with these species influences the execution of control plans, and therefore awareness must be accompanied by an exploration of knowledge appropriation and understanding of the general problem (Shackleton *et al.,* 2018). Table 1 represents the complexity of Cali's society and not only of a section of it, and this is relevant for detecting potential conflicts among social actors (Rout *et al.,* 2014; Andreazzi *et al*., 2017; Crowley *et al.,* 2017a; Waliczek *et al.,* 2017).

90% of interviewed people stated that they knew what an invasive species was, and 94% thought they were dangerous, but 81% had not witnessed a divulgation campaign on the issue. 61% of people did not know what to do if they found these species and 59% did not know to which environmental authority they should report the problem (Figure 2).

Concerning the giant African snail, 79% of participants considered they had a low to medium level of knowledge on the giant African snail. 83% of interviewees considered that the amount of information received was low to medium, whereas perception of the veracity of the information was homogeneously distributed over low, medium, and high levels. When asked about the work of the environmental authority in managing and controlling the species, 90% of people perceived it as low to medium, with a consensus on low performance of the authority (52%). People associated the species with environmental damage and harm to public health; over 55% of people considered that the species produces great damage, although the trend was towards greater harm to public health than to environmental damage. Despite, this preconception there was little knowledge on the parasites associated with the mollusk, and 65% of people admitted not knowing on the associated parasites for which the giant African snail is considered dangerous to public health.

Most scientific researchers on the relationship between people – giant African snail suggest a negative perception and a low knowledge about the snail by the studied community (Moreira *et al.,* 2012; Luizaga *et al.,* 2015; Sá *et al.,* 2016; Andreazzi *et al.,* 2017). The same trend was established for the city of Cali. However, knowledge in people about control types methods and basic biological aspects of the species was adequate. Therefore, the lack of access to this knowledge should not be the cause of little active participation in control activities (Rout *et al*., 2014). Unfortunately, this little participation of the people in control activities tended to reduce the effectivity of management policies and limits the viability of alternative and inclusive methods of control (Garcés *et al.,* 2016; Shackleton *et al.,* 2018).

Table 1. Percentage of socio-demographic characteristics of people interviewed on perceptions of the giant African snail (*A. fulica*) in the city of Cali.

Variable	Category	Participants (n=316)	Frequency (%)
Gender	Female	182	57.6
	Male	134	42.4
Age	14-20	44	13.9
	21-30	109	34.5
	31-40	48	15.2
	41-50	52	16.5
	>50	62	19.6
	No inform	1	0.3
Socioeconomic level	Low	84	26.6
	Medium	180	57.0
	High	52	16.5
Educative level	Elementary	7	2.2
	High school	82	26.0
	Technician	74	23.4
	Undergraduate	92	29.1
	Postgraduate	61	19.3
Educational institution	Public	152	48.1
	Private	153	48.4
	No inform	11	3.5

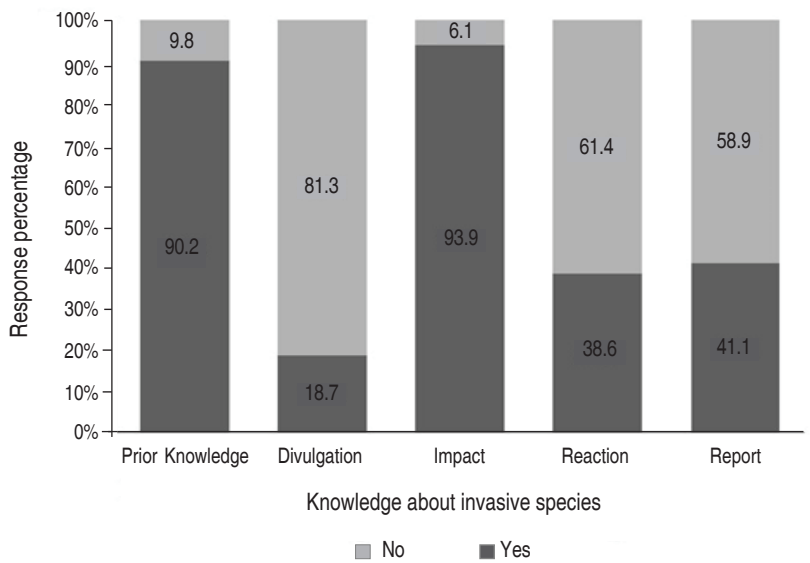

Figure 2. Knowledge perception of invasive species by Cali's interviewed people (n=316).

69% of the people surveyed indicated that they do not know how to manipulate and dispose the individuals of giant African snail when they detect them in their neighborhood. Moreover, 94% of interviewees had

never participated in control efforts, either by their own initiative, by the community association, or by the environmental authority, and 88% stated that they have not observed another invasive species besides the giant African snail (Figure 3). Most people have observed the giant African snail associated with green areas (61%) or gardens (14%), although their presence on crops and even as pets in rural areas was also mentioned. Finally, 73% of the interviewees stated that they do not know if nearby people have had situations with the giant African snail, and 88% of interviewees did not know if there is another species of invasive snail in Colombia.

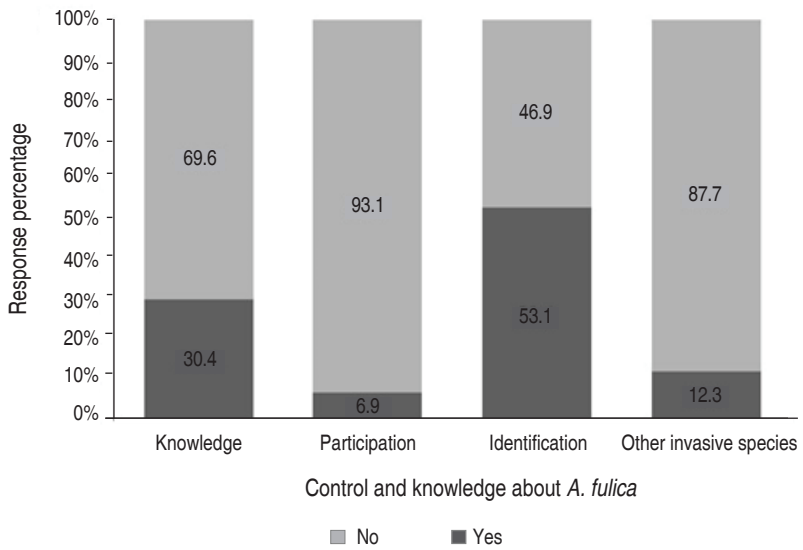

Figure 3. Perception of control efforts and knowledge on the giant African snail (*A. fulica*) by people interviewed in Cali's urban area (n=316).

The general knowledge perception of invasive species and methods of control were not related to any of the socio-demographic characteristics evaluated in this study. However, more men than women tended to associate this species with the negative impact of its presence on commerce, industry, and agriculture. People between 14 and 20 years old tended to react better to the presence of an invasive species around them (Table 2). It is not clear why people from Cali consider that the giant African snail is harmful in the context of public health if they do not know about the associated parasites. This association of the snail with public health could be attributed to the influence of mass media, which are the main source of divulgation on *Achatina fulica* in Colombia, although it is not the most reliable source (Russell and Balckburn, 2017; Patiño, 2018). Probably, the influence of the mass media on the people's knowledge about the giant African snail in the city of Cali is the reason why most of the variables of perception evaluated in this research depended on age but not on education level. Taking into account that the giant African snail was established as an invasive species in Colombia since 2008 (MAVDT, 2008) and that the public warning campaigns started since 2012, it is necessary to direct a more significant effort of sensitization and appropriation towards the citizens to get them involved in the management program as the key stakeholders.

There was a relationship of age, education level, and type of educative institution with the perception variables of giant African snails ($P<0.05$) (Table 3 and 4). People over 30 years of age had a negative perception about the level of knowledge on the mollusk ($P=0.001$), knowledge of parasites ($P=0.001$), other invasive species ($P=0.01$), sightings of the snail ($P=0.001$), knowledge of control ($P=0.004$), perception of the received information ($P=0.001$), and the work of the environmental authority

Table 2. Relationship between socio-demographic characteristics and perception variables on biological invasion.

Socio demographic character	Knowledge		Impact		Divulgation		Reaction		Report	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Gender										
Female	161(88)	21(12)	167(92)	15(8)	30(16)	152(84)	69(38)	113(62)	70(38)	112(62)
Male	124(93)	10(7)	130(97)	4(3)	29(22)	105(78)	53(40)	81(60)	60(45)	74(55)
P-value	0.256		0.058		0.247		0.815		0.298	
Age										
14-20	42(95)	2(5)	43(98)	1(2)	11(25)	33(75)	25(57)	19(43)	22(50)	22(50)
21-30	100(92)	9(8)	102(94)	7(6)	18(17)	91(83)	43(39)	66(61)	48(44)	61(56)
31-40	38(79)	10(21)	44(92)	4(8)	5(10)	43(90)	15(31)	33(69)	14(29)	34(71)
41-50	48(92)	4(8)	49(94)	3(6)	10(19)	42(81)	16(31)	36(69)	18(35)	34(65)
>50	56(90)	6(10)	59(95)	3(5)	15(24)	47(76)	23(37)	39(63)	27(44)	35(56)
P-value	0.119		0.801		0.287		0.076		0.222	
SE level[1]										
Low	76(90)	8(10)	79(94)	5(6)	20(24)	64(76)	36(43)	48(57)	38(45)	46(55)
Medium	159(88)	21(12)	170(94)	10(6)	30(17)	150(83)	66(37)	114(63)	68(38)	112(62)
High	50(96)	2(4)	48(92)	4(8)	9(17)	43(83)	20(38)	32(62)	24(46)	28(54)
P-value	0.247		0.805		0.376		0.627		0.385	
Educative level										
Elementary	7(100)	0(0)	7(100)	0(0)	4(57)	3(43)	3(43)	4(57)	5(71)	2(29)
High school	75(91)	7(9)	75(91)	7(9)	11(13)	71(87)	33(40)	49(60)	31(38)	51(62)
Technician	64(86)	10(14)	73(99)	1(1)	15(20)	59(80)	29(39)	45(61)	28(38)	46(62)
Undergraduate	83(90)	9(10)	83(90)	9(10)	16(17)	76(83)	34(37)	58(63)	37(40)	55(60)
Postgraduate	56(92)	5(8)	59(97)	2(3)	13(21)	48(79)	23(38)	38(62)	29(48)	32(52)
P-value	0.797		0.121		0.092		0.992		0.364	
School										
Public	136(89)	16(11)	145(95)	7(5)	30(20)	122(80)	62(41)	90(59)	57(38)	95(62)
Private	138(90)	15(10)	141(92)	12(8)	27(18)	126(82)	57(37)	96(63)	68(44)	85(56)
P-value	0.852		0.344		0.662		0.558		0.245	

[1] Socio-economic level.

(*P*=0.001), compared with people 14 to 29 years old. Deeper knowledge on this subject depends on the type of institution, with students or graduates from private schools being more aware of the issues surrounding them (*P*=0.038) (Table 3 and 4). Similar results have been reported in Brazil where a close relationship has been established between stratum and education level, with some perception variables similar to those evaluated in the present study (Sá *et al.,* 2016; Andreazzi *et al*., 2017; Shackleton *et al.,* 2018).

Table 3. Relationship between socio-demographic characteristics and perception variables on *A. fulica* in the city of Cali. 0 (low), 1 (medium), 3 (high).

Socio demographic characteristics	Level Knowledge			Ambiental damage			Health damage			Parasite Knowledge		Invasive species		Identification	
	0	1	2	0	1	2	0	1	2	Yes	No	Yes	No	Yes	No
								(%)							
Gender															
Female	59(33)	84(46)	38(21)	22(12)	58(32)	102(56)	16(8)	43(24)	123(68)	60(33)	122(67)	18(10)	163(90)	95(52)	86(48)
Male	40(30)	68(51)	26(19)	15(12)	42(31)	77(57)	15(11)	39(29)	80(60)	50(37)	84(63)	21(16)	113(84)	72(54)	62(46)
P-value		0.764			0.959			0.364			0.474		0.166		0.909
Age															
14-20	6(14)	27(61)	11(25)	1(2)	18(41)	25(57)	2(5)	16(36)	26(59)	24(55)	20(45)	8(18)	36(82)	36(82)	8(18)
21-30	27(25)	59(54)	23(21)	12(11)	40(37)	57(52)	7(6)	30(28)	72(66)	55(50)	54(50)	17(16)	91(84)	72(66)	37(34)
31-40	27(56)	16(33)	5(11)	9(19)	13(27)	26(54)	8(17)	12(25)	28(58)	8(17)	40(83)	0(0)	48(100)	18(38)	29(62)
41-50	20(38)	24(46)	8(16)	8(15)	13(25)	31(60)	8(15)	13(25)	31(60)	11(21)	41(79)	8(15)	44(85)	22(42)	30(58)
>50	19(31)	25(41)	17(28)	7(11)	16(26)	39(63)	6(9)	11(18)	45(73)	12(19)	50(81)	6(10)	56(90)	19(31)	43(69)
P-value		0.001			0.188			0.191			<0.001		0.01		<0.001
SE level[1]															
Low	36(43)	36(43)	12(14)	12(14)	24(29)	48(57)	8(10)	21(25)	55(65)	27(32)	57(68)	10(12)	74(88)	50(60)	34(40)
Medium	52(29)	86(48)	41(23)	22(12)	59(33)	99(55)	19(11)	47(26)	114(63)	68(38)	112(62)	20(11)	159(89)	97(54)	82(46)
High	11(21)	30(58)	11(21)	3(6)	17(33)	32(61)	4(8)	14(27)	34(65)	15(29)	37(71)	9(17)	43(83)	20(38)	32(62)
P-value		0.063			0.609			0.989			0.427		0.469		0.053
Educative level															
Elementary	2(29)	3(43)	2(29)	1(14)	4(57)	2(29)	0(0)	2(29)	5(71)	0(0)	7(100)	0(0)	7(100)	5(71)	2(29)
High school	25(30)	42(51)	15(18)	12(15)	27(33)	43(52)	11(13)	15(18)	56(68)	39(48)	43(52)	10(12)	72(88)	52(63)	30(37)
Technician	26(36)	30(41)	17(23)	11(15)	22(30)	41(55)	9(12)	22(30)	43(58)	20(27)	54(73)	9(12)	65(88)	35(47)	39(53)
Undergraduate	30(33)	47(51)	15(16)	8(9)	29(32)	55(60)	5(5)	27(29)	60(65)	33(36)	59(64)	12(13)	79(87)	51(56)	40(44)
Postgraduate	16(26)	30(49)	15(25)	5(8)	18(30)	38(62)	6(10)	16(26)	39(64)	18(30)	43(70)	8(13)	53(87)	24(39)	37(61)
P-value		0.818			0.604			0.483			0.014		0.992		0.033
School															
Public	53(35)	66(44)	32(21)	19(12)	48(32)	85(56)	14(9)	40(26)	98(64)	54(36)	98(64)	18(12)	133(88)	78(51)	74(49)
Private	43(28)	78(51)	32(21)	16(10)	48(31)	89(58)	16(10)	39(25)	98(64)	52(34)	101(66)	19(12)	134(88)	83(55)	69(45)
P-value		0.36			0.842			0.953			0.811		1		0.646

[1] Socio-economic level

Table 4. Relationship between socio-demographic characteristics and perception variables on control of *A. fulica* in the city of Cali. 0 (low), 1 (medium), 3 (high).

Socio demographic characteristics	Control Knowledge		Participation in control		Extern Knowledge		Satisfy with the information			Information reliability			Environmental authority		
	Yes	No	Yes	No	Yes	No	0	1	2	0	1	2	0	1	2
								(%)							
Gender															
Female	52(29)	130(71)	47(26)	135(74)	10(5)	172(95)	85(47)	74(41)	23(13)	73(40)	56(31)	53(29)	94(52)	74(41)	14(7)
Male	44(33)	90(67)	37(28)	97(72)	12(9)	122(91)	62(46)	46(34)	26(19)	46(35)	50(38)	37(28)	70(52)	52(39)	12(9)
P-value	0.458		0.267		0.797			0.212			0.421			0.883	
Age															
14-20	22(50)	22(50)	13(30)	31(70)	4(9)	40(91)	11(25)	20(45)	13(30)	7(16)	20(45)	17(39)	15(34)	23(52)	6(14)
21-30	39(36)	70(64)	35(32)	74(68)	12(11)	97(89)	34(31)	54(50)	21(19)	24(22)	42(39)	42(39)	49(45)	53(49)	7(6)
31-40	9(19)	39(81)	9(19)	39(81)	3(6)	45(94)	32(67)	13(27)	3(6)	29(60)	14(29)	5(10)	34(71)	14(29)	0(0)
41-50	12(23)	40(77)	13(25)	39(75)	2(4)	50(96)	38(73)	10(19)	4(8)	30(58)	11(21)	11(21)	33(63)	17(33)	2(4)
>50	14(23)	48(77)	13(21)	49(79)	1(2)	61(98)	32(52)	22(35)	8(13)	29(47)	18(29)	15(24)	32(52)	19(31)	11(18)
P-value	0.004		0.151		0.355			<0.001			<0.001			<0.001	
SE level[1]															
Low	24(29)	60(71)	27(32)	57(68)	5(6)	79(94)	45(54)	28(33)	11(13)	32(38)	32(38)	20(24)	37(44)	38(45)	9(11)
Medium	56(31)	124(69)	44(24)	136(76)	16(9)	164(91)	76(42)	71(39)	33(18)	67(37)	54(30)	58(32)	102(57)	64(36)	14(8)
High	16(31)	36(69)	13(25)	39(75)	1(2)	51(98)	26(50)	21(40)	5(10)	20(38)	20(38)	12(23)	25(48)	24(46)	3(6)
P-value	0.942		0.217		0.403			0.325			0.461			0.29	
Educative level															
Elementary	2(29)	5(71)	4(57)	3(43)	0(0)	7(100)	3(43)	3(43)	1(14)	2(29)	3(43)	2(29)	1(14)	2(29)	4(57)
High school	22(27)	60(73)	25(30)	57(70)	6(7)	76(93)	30(37)	34(41)	18(22)	25(30)	28(34)	29(35)	38(46)	35(43)	9(11)
Technician	22(30)	52(70)	15(20)	59(80)	3(4)	71(96)	41(55)	21(28)	12(16)	36(49)	23(32)	14(19)	47(64)	23(31)	4(5)
Undergraduate	31(34)	61(66)	24(26)	68(74)	10(11)	82(89)	40(43)	39(42)	13(14)	31(34)	32(35)	29(32)	49(53)	38(41)	5(5)
Postgraduate	19(31)	42(69)	16(26)	45(74)	3(5)	58(95)	33(54)	23(38)	5(8)	25(41)	20(34)	16(26)	29(48)	28(46)	4(7)
P-value	0.91		0.487		0.242			0.172			0.346			0.01	
School															
Public	49(32)	103(68)	32(21)	120(79)	9(6)	143(94)	76(50)	47(31)	29(19)	61(40)	48(32)	42(28)	72(47)	65(43)	15(10)
Private	44(29)	109(71)	49(32)	104(68)	12(8)	141(92)	66(43)	67(44)	20(13)	53(35)	54(35)	46(30)	84(55)	58(38)	11(7)
P-value	0.536		0.652		0.038			0.052			0.592			0.373	

[1] Socio-economic level

CONCLUSIONS

The people of the city of Cali of all economic conditions and all academic level, manifested a negative perception about the management actions carried out in the city by local environmental authority against the giant African snail invasion. This dissociation between people and the actions carried out by the local environmental authority must be solved to achieve the success of local management plan for this invasive species. Therefore, we recommend a deep adjustment of the institutional management policy that was established to respond as a city to the giant African snail invasion in Cali, being required that people become the central stakeholder.

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