UCV –HACER

ISSN PRINTED: 2305-8552
ISSN ELECTRONIC: 2414-8695

Research and Cultural Journal, César Vallejo University, Campus Chiclayo

UCV HACER Res. Cult.Jrnl. Volume 5, N° 1, January – June 2016
Chiclayo, Lambayeque - Peru

Zootechnical characterization of alligator Callopistes flavipunctatus of Morrope

ARBULÚ LÓPEZ, César Augusto[1]; DEL CARPIO RAMOS, Pedro Antonio[2]; DEL CARPIO RAMOS, Hilda Angélica[3]; CABRERA CORONADO, Raul Germán[3]; GONZÁLEZ CASAS, Noé[4]

Abstract

This research was carried out to characterize zootechnically of alligator, *C. flavipunctatus*, as a food source and natural resource cooperating for its preservation and sustainable exploitation. Specimens of both genders were collected from January to April 2015 in the countryside Morrope. The live weight, weight and bones yield, acceptance of meat flavor were evaluated. The results show that the examined alligator should be considered as a quality meat suitable source. The research of species should continue to determine if there are some real effect on the assumed qualities by popular culture, to rule out the presentation of zoonoses and the possibility to create protected or exclusion zones to allow the best reproduction of species to avoid predation and to replant the forest.

Key words: Zootechnical characterization, alligator, *Callopistes flavipunctatus*.

Received: October 07, 2016
Accepted: October 27, 2016
Published: December 2016

[1] Environmental sciences Doctorate; Professor of Universidad César Vallejo; calessus1@yahoo.es
[2] Environmental sciences Doctorate; Professor of Zootechnical Faculty UNPRG; delcarpiofiz@hotmail.com
[3] Education Doctorate, Professor of Economic, Administrative and Accountable Sciences, UNPRG; angelicadcr@hotmail.com
[4] BA in Zootechnical and Veterinary medicine UNPRG; germanc1801@hotmail.com
[5] BA in Zootechnical and Veterinary medicine UNPRG; ngc_9@hotmail.com

ISSN PRAINTED: 2305-8552
ISSN ELECTRÓNIC: 2414-8695

Introduction

The diet of rural and suburban dwellers consists mainly in food supplies providing energy (cereals, tubers); however, protein-rich foods are fewer quantities as plant origin (soybean) and animal origin (eggs, chicken, bovine, pork, etc.) Those last ones are very important due to the high concentration of crucial essential amino acids. Due to the reduced capacity purchasing, the diet has lower protein sources, it reduces the use of meat from non-traditional species, such as "hunting meat".

"Hunting meat" from some species has special properties, it must be named "functional food", it means that it supplies energy and protein, and it has benefits related with quality of health.

Reptiles are highly regarded in the utilization as a food source. Big alligators have been important feed since prehistoric times and they are still-hunted in some parts of Asia, Africa and Latin America. Certain of them are carnivorous species, which can be difficult to feed and grow economically (for example, the Monitor alligator is sold in Indochina markets.) (NRC, 1991).

Del Papa and Moro (2014) mention in some research, the purchasing of saurian "Tupinambis" genus for three archaeological regions in Argentina, with records of late Holocene. They say that in Beltrán Onofre Banegas-Lami Hernández archaeological site (Robles Department, Santiago del Estero), is located 27º 49 '08 "of O longitude, in Chaco-Santiagueña archaeological region of northwestern Argentina, economically Tupinambis meriane (Overo alligator) is the most important reptile, with a weight of 4.15kg. The authors add that nowadays in the region, only this species could live in the most humid area between 1000 and 1260 AD.

In Lambayeque region - Peru, rural and certain suburban dwellers said that alligator meat, Callopistes flavipunctatus is consumed by a considerable sector of rural dwellers due to the medicinal, nutritional and special qualities; however, it is admitted without knowledge about a determined scientific support based on the chemical composition.

Wherefore we ask: What characteristics as food source does Callopistes flavipunctatus alligator have from the seasonally dry tropical forest of Mórrope?

The following **hypothesis** was considered: The characteristics as food source in *Callopistes flavipunctatus* alligator from the dry tropical forest of Morrope, change according to the gender and the summer months. The **objective** was to characterize Callopistes flavipunctatus as food source alligator from the dry tropical forest of Mórrope.

Callopistes flavipunctatus alligator is not an iguana; it should consider like a "false iguana", foreign researchers call it "false motior alligator", because it is very similar to monitor alligator. The following taxonomic classification is: Animal Kingdom; Phylum, chordates; Subphylum, vertebrates; Class, reptiles; Order, squamata; Family, teiidae; Genus, *Callopistes*; species, *Callopistes flavipunctatus* (Myers et *al., 2016*).

Crespo and Koch (2015) mention that "false monitor" *Callopistes flavipunctatus* (Duméril y Bibron, 1839), was primitively described such an *Apomera flavipunctata*, but afterwards, it was changed to *Callopistes* genus by Gray (1845) as the only close taxon of *C,Maculatus.* Gravenhorst, 1838. The same authors point out that nowadays some taxonomists prefer to put it in the monotypic genus, *Tejovaranus*, due to its distribution is far distant (from more than 2000km) to *C. maculatus* chilean and it has morphological differences with respect to the sexual organs: *C flavipunctatus* female has a larger hemiclitoris (18mm) than C. *maculatus* (1mm). Crespo and Koch (op.cit.) consider that in accordance with a latest review of tissues taxonomy and a total order of review Squamata, they prefer to call it *Callopistes.*

Crespo and Koch, (2015) mention important bibliographical sources to describe *C. flavipunctatus* as a large species of tissue until 1000 mm in total length. Males grow up snout-cloaca length (SVL) 300 mm and females grow up until 230 mm. The tail is so long and it measures 2.5 times of the body length. Apart from SVL, males also have a bigger head than female. Moreover, the authors believe that *Callopistes flavipunctatus* is regional from equatorial dry forest, in the western slopes of northern Peru and south Ecuador. Peruvian people know that this species lives in Tumbes, Piura and Lambayeque; also, its existence in Jaen has been registered.

Heliophilic alligators are ground habitants that dig burrows where they are safe from hostile climatic periods. Information about their diet is scarce; what is available specifies that the tissues of the *Dicrodon* genus represent their main prey, among other lizard species, small rodents and large insects. The curved teeth and the particularly muscular and expandable stomach are used to the predation and the large prey digestion. Crespo and Koch's observation support that C. flavipunctatus looks for prey mainly in the ground but, it sometimes climb on bushes and trees (they take advantage of the good development of their fingers and nails, like other alligators and lizards, the information has been defined by Ribas et *al., 2004*). Predation habits provide additional evidence that it is a carnivore such as its Chilean congener C. maculatus, which also consumes lizards, birds, insects and small mammals.

The morphological evolution of organisms is intimately linked to adaptation through the performance and total behavior of the animal. Alligators have been as a model system for the adaptation of the locomotor apparatus because they exhibit a wide variety of locomotor behaviors and abilities. The variation in general morphology, particularly in the hind extremities length, has evolved association with differences in speed performance and environmental locomotor needs, providing convincing evidence of adaptation (Arnold, 1983; Losos and Sinervo, 1989, Losos, 1990, Garland and Losos, 1994, Bonine and Garland, 1999, Irschick and Jayne, 1999, Irschick, 2002). These evolutionary characteristics of adaptation constitute what make them suitable supplier meat.

Two main reasons are usually mentioned to explain the observed variation in locomotory behavior of alligators: The selection is associated with the foraging strategy or with the predator-escape behavior. Alligators are particularly varied in their foraging strategy. The patient foragers, which sit down and wait (ambush), remain immobile for a long time and they rely on short bursts of locomotion to capture prey, which is moving within their proximity. Otherwise, the active foragers spend much time moving in search of their prey.

It has been shown that differences in the foraging mode influence the evolution of life history strategies, covering a wide range of aspects such as alligators' behavior, diet, morphology, and physiology. Sit down -and-wait foragers move very fast but not always since, they do not often require high resistance; as opposed to the high activity levels in active foragers can be advantage of resistance in the locomotor system. These different demands imply that selection for acceleration and speed to preempt their prey or resistance for a continuous search may influence the evolution of muscle fiber type in the locomotion (Anderson and Karasov, 1981; Snell et al., 1988; Cooper, 1994, Garland and Losos, 1994, Miles et al., 2007, Reilly et *al., 2007*). The muscle cell is known as "muscle fiber", it is the main source of meat.

The escape behavior of predators is commonly mentioned as a selective force, which acts, on the morphology and the performance of alligators. However, some species rely on the stealth to avoid detection by predators; other species use their speed to flee from predators. In this way, alligators that escape due to the rapidity are presumably under strong selection for high accelerations and maximum speed in comparison with alligators that use a generalized strategy; while alligators that rely on the stealth, can experience relaxed selection aspects of locomotion related to speed (Snell et al., 1988; Garland and Losos, 1994; Vervust et *al., 2007*). Being C. flavipunctatus alligator is a predator that develops great speed; its hind extremities show strong muscular development.

The locomotion is obtained for using using skeletal muscles. In vertebrates, the muscles are composite structures, which are constituted mostly in three common types of fibers: fast-contraction glycolytic fibers, fast-shrinking oxidative glycolytic fibers and slow-shrinking oxidative fibers. Each of the fibers types differs in generated force, contraction speed and fatigue resistance. Rapid contraction glycolytic fibers (FG) allow short rapid speed (V) and maximum short velocities (Vmax). FG fibers can produce the high strength and necessary power for speed but rapid fatigue.

On the other hand, slow oxidative fibers (SO) create low values of V and Vmax, produce low strength and power, and a fatigue more slowly. Finally, fast-shrinking oxidative glycolytic fibers (FOG) have intermediate values of V and Vmax, generally producing intermediate strength and potency, and they show intermediate resistance to tire. Since there are limits on the total muscle mass (therefore, the amount of muscle fibers) the proportion of a muscle fiber type must reflect its functional requirements (Peter et al., 1972; Gleeson, et al. ., 1980, Gleeson and Johnston, 1987, Rome et *al., 1990*). When the fibers of fast contraction are hypertrophic constitution, the muscle is more developed; allowing finding more muscle masses, which give rise to more meat.

A large variation in the composition of the muscle fiber type among alligator species has found, these species generally have a negative relationship between FG and FOG fibers. Notably, it has been found that two small parts of alligators have experienced an unusually large amount of evolutionary change in the composition of the muscle fiber type during a short period, it has been proposed and based on these findings, that the selection could give shape to the composition of the iliofibularis fiber type of these alligators (Bonine et *al., 2001, 2005*).

Evolutionary models base on predator-escape and foraging strategies of alligators have been demostrated to assess whether the composition of the fiber type of a leg muscle has been adapted for behavior. The best-fixed model for the evolution of the type of rapid contraction fiber was based on the predator-escape strategy, while the model for foraging was poorly fixed. According to the predator-escape model, alligators that rely on speed to avoid predators have relatively higher

“UCV-HACER” Rev. Inv. Cult. 5(2): 112-124.
July-December 2016, Campus Chiclayo, Lambayeque-Peru.
ISSN PRAINTED: 2305-8552
ISSN ELECTRÓNIC: 2414-8695

proportions of FG fibers (70%), while stealth alligators have relatively higher proportions of FOG fibers (77%). This pattern suggests an evolutionary trend towards a greater composition of FG-type fibers (FOG) among alligators that specialize in speed (Scales *et al., 2009).*

These muscular characteristics of alligators developed muscles in which predominate fast-twitch muscle fibers these ones have conferred peculiarities for their use as meat-providing animals. The fast-twitch muscle fibers are hypertrophic (diameter considerably greater than those of slow contraction are), allowing greater muscle mass (meat).

The proposed characterization in this research is the species as a food source (zootechnic). When turning to the Dictionary of the Spanish Language (DLE), in the twenty-third edition, published in 2014, the meaning of “Characterization” term is given", it means "the act and effect of characterizing or be characterized"; while, the same source indicates that the meaning of "characterize" is “to determine the peculiar attributes of someone or something, so that it evidently distinguishes itself from the others". Thus, the characterization of *Callopistes flavipunctatus* species seeks to identify the zootechnical properties that distinguish it from others which also have or may have zootechnical use.

In that case, the "zootechnical" term must be defined according to DLE (op.cit.) animal husbandry is the art of breeding, multiplication and improvement of domestic animals; whereas the meaning that was given to "zootechnical" is associated or relative to animal husbandry. Consequently, according to DLE, only domestic animals would be implicit in animal science. However, the professions field involves, as well as species, allowing expanding or shrinking.

In case of that, term is limited only to domestic species, the Zootechnical term has not been considered by the Royal Spanish Academy, which is based on the use of animal to obtain food, animal hide, work, etc.; it means, it is linked to the use of animal species. Moreover, several wild animals are zootechnical interest, because people obtain top quality food, animal hide, work, etc. Domesticity is to have animals close enough to touch them (yards, herds, etc.), and to tame them.

When a wild species are zootechnical interest, we start to raise, breed, bring up and keep it well. This way Captivity is used, which is to raise wild animals in captivity in order to breed, bring up and keep well and naturally, we make use of them. Taking into account the aforementioned definition about captivity, definitions are been very different to DLE's definition, to consider the action field of Animal husbandry. Del Carpio (2011), after doing a review to the action field of Zootechnical Engineering, determined that the zootechnical interest fundamentally resides in food and sub - products of animal origin, also in business or company which it could work with animals and it examines the exclusion of wild species of this action field; especially if food and useful by-products are obtained from them, and it is possible to work in a company.

To characterize zootechnical to an animal producing species of meat, it is necessary to determine the) live weight that obtain in the moment of the slaughter, the weight of the bones yield (the body without skin, without intestinal entrails, without final part of the extremities and without head, in some species), the performance of framework (it is the relation between the bones yield weight and the alive weight) that generally expresses in percentage. The chemical composition and acceptance of the meat (generally depending on the flavor, smell, color, etc.) In case of domestic species (specialized for meat production), also it is important the food conversion (how much feed does an animal eat to increase a kilo of weight?), which is inappropriate in wild animals, they have not been suitable to do maximum utilization of food to increase weight, because the food quantity which they consumed, is unknown. This characteristic could be determined when it is about captivity conditions.

Method

This research was carried out with *C. flavipunctatus* alligartor specimens, which were collected in Morrope countryside, Morrope distric, Lambayeque Province, Lambayeque region. Morrope is located 35 km to north Chiclayo, on the edge of the current Panamericana highway, which ties to Chiclayo cities with Piura; a 6º32'33.81"S and 80º00'45.63"O, 21 meters above sea level. The district has an area of 1301.21 km^2.

Figure 1. ***Satellite view of Mórrope district***
Fuente. Google Earth

In Figure 1 (2015 DigitalGlobe, Google), the satellite sight of Morrope district is shown, where its principal characteristics are obeserved; It is remarkable that the majority of territory is desert. Due to “El niño” phenomenon, Morrope tends to fill up with carob trees, principally, due to the rainfall and high environmental temperature benefit the seed germination.

According to Tossi (1996), area is a sub-tropical desert; nevertheless, it tends to denominate the "carob tree" as the seasonally dry sub - tropical forest.

The studied population corresponded to all adult specimens of both genders, of the *Callopistes flavipunctatus* species in Mórrope. 48 specimens, which were the rate of 12 specimens in four months of the field phase, constituted the sample; within every month, three specimens were hunted for each week. It was determined that it is about an animal species, which has been included inside the NT categorization (almost threatened), where only a research can carry out by recognized organism, the sample should be as representative as possible without being very big; for this reason, it was chosen the non-probabilistic sampling of intentional type or convenience.

Within the used materials has had: For sampling specimen; for slaughter, skinning and gutted; to collect samples of meat; for the laboratory of analysis; to appraise meat. The techniques included the captures with a slip-knot; slaughter with disturbance to the sense, bleeding by intensity; determination of protein by Kjeldahl; survey application to determine the meat’s acceptance.

In the team, slip-knot of halyard pole; electronic scale of precision (Sartorius); tape measure; surgical blade and scalpel handle; digital photographic camera, analysis equipment of protein were used from the Nutrition Laboratory of Zootechnical Engineering Faculty, UNPRG (Pedro Ruiz Gallo National University).

The specimens were collected during four consecutive months (from January to April 2015); Different places from Morrope countryside were studied, all specimens were adults and of both genders.

A pole provided pole of slip-knot was used due to alligators expect to raise their temperature to mobilize rapidly. The hunt was carried out between 8 and 10 in the morning. When they do not warm enough their movements, alligators tend to be slow or short, what was an advantage to hunt them. They were immediately introduced in a sackcloth and then moved up to the environment in where the slaughter, skinning and gutted were carried out.

Before proceeding it, the live weight and the length of each specimens were studied; a Sartorius electronic scale was used with an approximation of thousandth of gram. For the measurement, a metric tape was use; it is measured up from the top of the snout to the top of the tail.

The sacrifice process consisted in disturbance to the sense, bleeding, skinning and gutted. For the disturbance to the sense, a punch was used to break the notochord, and to immobilize the animals with the propose they cannot feel pain; immediately, it was proceeded to cut the neck with a scalpel and they bleed by intensity in fifteen minutes; then it proceeded to the skinning, when the animal hide was obtained, it was identified and weighed; after that, the evisceration and separation of head; once the bone yield was obtained, afterward it was weighted.

A chef from Chiclayo was contacted, who cooked creole dishes; theses ones were served in a session of tasting, where professionals of livestock sector and some particular guests participated, they sampled the dishes, then a paper was delivered them to write, if they liked the meat and how did it like better?

In addition, the statistical analysis, the variables of live weight, and performance of bond yield were evaluated through a random unrestricted design, with factorial arrangement 4 x 2 (months for genders), where the following linear additive design adjusts:

$$Y_{ijk} = \mu + \alpha_i + + \beta_j + (\alpha\beta)_{ij} + \xi_{ijk}$$

Duncan's Multiple Range Test (MRT) was applied, only when F value was significant; in case of genders, the F significant value allowed to determine which was the biggest. In case of the test of tasting, a statistical evaluation was proceeded, using Chi - Square test without a priori hypothesis.

Percentage comparatives were applied to do the critical analysis of the obtained results apart from the determination of averages, standard diversions and coefficients variation. For the statistical analysis, Cochran and Cox’s recommendations were followed (2008).

Results

In table 1, according to main effects, there are results related to the live weight of *Callopistes flavipunctatus,* specimens, Morrepe.

Table 1
According to months of sampling and gender, live weight, grams of *C. flavipunctatus* specimen, Morrope 2015.

"UCV-HACER" Rev. Inv. Cult. 5(2): 112-124.

July-December 2016. Campus Chiclayo, Lambayeque-Peru.

ISSN PRAINTED: 2305-8552

ISSN ELECTRÓNIC: 2414-8695

Main effect	n	Average	D.E.	C.V. %
Month:				
January	12	431.2b	147.5	34.2
February	12	511.0a	198.9	38.9
March	12	411.8b	128.3	31.2
April	12	350.8c	109.5	31.2
Gender:				
Male	15	563.9A	190.1	33.7
Female	33	363.6B	83.9	23.1
Average	48	426.2	156.0	36.6

A, B, different exponential letters about the averages indicate significant differences ($P \leq 0.05$) or highly significant ($P \leq 0.01$) between the groups.

The differences between the months were significant ($P \leq 0.05$); when Duncan's test was carried out, It was determined that the greatest weight corresponded in February, followed by January and March and the more minor average weight was registered in April. However, the variation is considerably high, although it is normal to work with wild species. For all months, the coefficient variation was above 30%.

The trend is illustrated in figure 2, it has been considered as 100% in February, in March symbolized 80.6%, and in April 68.6 % in what had been achieved during February. Genders are compared in the figure 3, the differences were highly significant ($P \leq 0.01$) in favor of males; keeping coefficients variation of considerable magnitude, it observes that the variation in females was decreased (23.1%), which did not happen with males; behavior indicative which shows that males were the most dissimilar in body weight.

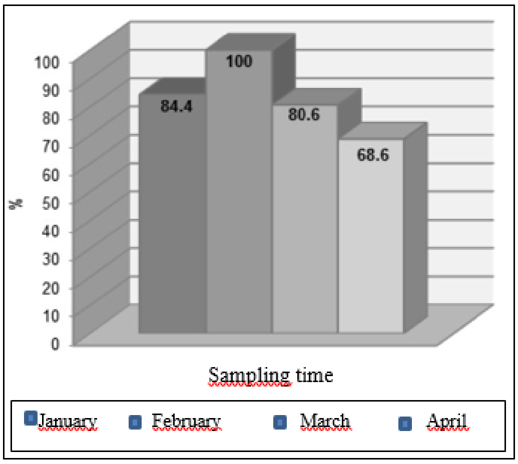

Figure 2. Comparative percentage of months for alive weight in *Callopistes flavipunctatus*, Morrope, 2015.

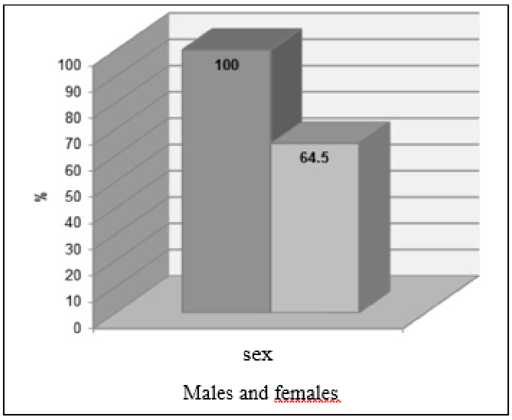

Figure 3. Comparative percentage of genders for live weight in *Callopistes flavipunctatus*, Morrope, 2015.

Even when the variation is high, it is difficult to give solid comments about certain trend; the weights improved in February and from there they tend to decrease. This trend can be attributed to the highest difficulty in the nutrient supplies as the cold season or the possibility of having hunted younger specimens due to different behavior in the hibernation process according to the age. The principal effect of gender was analyzed, the variation in females decreased (23.1%), it did not happened in males; the indicative behavior which shows that males were the most dissimilar in body weight.

Cabrera (2002) states average weights 583.6 grams for males and 432 grams for females; these weights are relatively higher than which were found in this research, the difference support primarily the lower weight of females. Muñoz (1994) stated that, the tendency of weights is geared towards the reduction; due to every time there are scarce specimens with an extra kilo.

The overall weight of specimens sampled by Cabrera in 2002 was 509.8 grams, while in the recurrent research was 426.2 grams; the difference is of 83.6 grams, which represents a low weight of 16.4%. However, due to the oldest specimens (the heaviest ones) tend to stay away from people, it is possible that the sample may have been inclined to lower weights because of it could be young specimens with little experience on their proximity to the environments, which are frequented by humans (Campoverde, 1989).

The results associated with the weight and bones yield performance are shown in Tables N° 02 and 03, respectively, for *Callopistes flavipunctatus* specimens, Morrope, 2015.

Table 2

Weight of bones yield, grams in *C. flavipunctatus* specimens according to month of sampling and gender, Morrope, 2015.

Main effect	n	Average	D.E.	C.V. %
Mes:				
January	12	331.2b	98.6	29.8
February	12	398.2a	146.9	36.9
March	12	328.4b	98.8	30.1
April	12	276.3c	90.5	32.8
Gender:				
Male	15	433.5A	138.3	31.9
Female	33	288.1B	67.4	23.4
Average.	48	333.5	115.9	34.8

A, B different letters exponential about averages indicate significant differences (P ≤ 0.05) or highly significant (P ≤ 0.01) between the groups.

For bones yield weights, the statistical analysis indicated that the differences between the months were significant (P ≤ 0.05). The greatest bones yield weight was achieved in hunted specimens in February, followed by January, March, and April; such as the live weight, the averages show variation coefficient relatively high. The percentage distribution of bones yield weights between the evaluated months followed the same trend as the live weight; figure n°4 shows that in January was 83.3 % in comparison to February, while March and April were 82.5 and 69.4 % respectively.

The differences between genders were highly significant (P ≤ 0.01), which indicates that at when it compares percentage both figures, they show that females have 2-3 of bones yield weight in contrast with males. Figure No. 5 shows the comparative percentage between the genders.

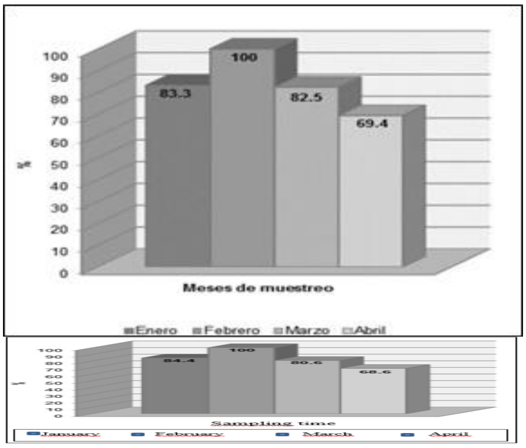

Figure 4. Comparative percentage of months for bones yield weight of *Callopistes flavipunctatus*, Morrope, 2015

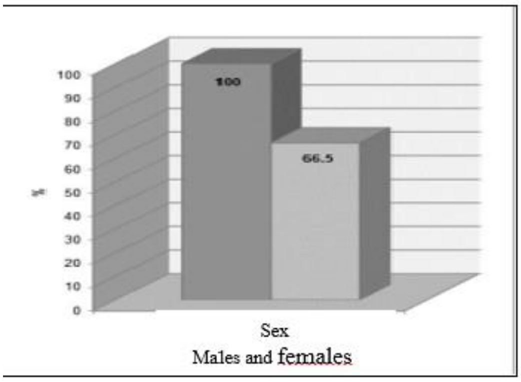

Figure 5. Comparative percentage of genders for bones yield weight in *Callopistes flavipunctatus*, Morrope, 2015.

For bones yield performance, the statistical analysis indicated that differences did not achieve statistical significance. The value of variation coefficient for each months changed between 2.4 and 4.5%. The significance lack is indicative because there are no defined trends in this variable; therefore, all averages are very similar in magnitude.

Table 3

Bones yield, %, *C. flavipunctatus* According to months of sampling and sex, Morrope, 2015.

Main effect	n	Average	D.E.	C.V. %
Month:				
January	12	77.6a	3.50	4.5
Febrero	12	78.5a	2.40	3.1
March	12	79.9a	1.90	2.4
April	12	78.4a	2.70	3.4
Gender:				
Male	15	77.4b	3.40	4.4
Female	33	79.2a	2.20	2.8
Average.	48	78.6	2.70	3.4

A, B different letters exponential about averages indicate significant differences (P ≤ 0.05) between the genders.

Statistical significance was reached between the differences of genders; females are a bit superior in contrast with males, 77.4 and 79.2% respectively. In the statistical analysis, it was observed that the interaction months x gender reached a significance (P ≤ 0.05) it is due to males had higher than females in April. However, in January, February and March, females were higher than males.

With respect to the bones yield weight, the overall weight was 333.5 grams; it represents an advantage of supplying of animal origin protein to people. One of the serious problems with large animals, including ovine and caprine, reside the needs of family when animals are slaughtered. For this reason, species such as guinea

"UCV-HACER" Rev. Inv. Cult. 5(2): 112-124.

July-December 2016. Campus Chiclayo, Lambayeque-Peru.

ISSN PRAINTED: 2305-8552

ISSN ELECTRÓNIC: 2414-8695

pigs, rabbits or alligators are better; it can slaughter one or two specimens without fear of wasting or preservation problems of surplus. The problem gets worse in the Peruvian rural sector, where a large part of people do not have electrical energy. Because of that, *C. flavipunctatus* and other reptiles are considered within small conformant species of "Micro Livestock" (National Research Council, 1991).

Cabrera (2002) reported that bones yield weights are slightly less from what they were found in this research, alive weights were greater even when this author indicated them; it was because in this research, the head was included in bones yields, which can weigh 45 grams, though in case of males can exceed 60 grams. The head was included in bones yield, because in the countryside, alligators' head are eaten in soups. Although, the trade in Chiclayo, people do not add the head in cured meat, due to the difficulty to dehydrate it rapidly and the decomposition, and the frequent bad smell. Some people prefer bones yield because it is fleshy in the muscles jaw.

The musculature of *C. flavipunctatus* alligator's posterior extremities has an important component in bones yield to supply meat, it is evident that the posterior extremities of this predator have suffered a strong pressure of selection to react to the need of the sudden stealth attack on the prey and to flee of its predators, motivating to a great muscle mass development. (Arnold, 1983; Losos and Sinervo, 1989; Losos, 1990; Garland and Losos, 1994; Bonine and Garland, 1999; Irschick and Jayne, 1999; Irschick, 2002).

It showed that the differences in the foraging mode influence the evolution of species, accordingly, their survival strategies; covering a wide range of aspects such as behavior, diet, morphology, and physiology of alligators. The patient foragers, which sit down and wait, move very fast but not always, because they do not often have high strength; on the contrary, the high-level activity of actives foragers can get advantage on the locomotor system resistance. These different demands imply that the selection for the acceleration and speed to get ahead of the prey or to resist the constant search can influence the evolution of the muscular fiber type in the locomotion (Anderson y Karasov, 1981; Snell *et al.,* 1988; Cooper, 1994; Garland y Losos, 1994; Miles *et al.,* 2007; Reilly *et al.,* 2007). Therefore, the posterior extremities are dependent on a greater reserve of glucose for using as fuel in fast chases; this reserve helps to capture prey or to flee from the predator. Thus, the muscle fibers of the posterior extremities are greater diameter (hypertrophic) and they respond very well as a source of meat.

The alligator's tail has an important source of meat; however, this part has had a different evolutionary strategy. In this case, it is necessary to do a study when the alligator is moving, since it uses it like a steering wheel body during its quick change and it is not exhausted. For this reason, the tail has a large amount of accumulating fat, which is a useful fuel for slow twitch muscle fibers. In culinary area, this part of the alligator's body is very nutritional to soups. Hunters use it to pack and sell in Chiclayo and Piura markerts (Del Carpio and Cabrera, 2004).

In table 4, the protein and fat contents are shown as samples of muscle tissue of Callopistes flavipunctatus' tail in different sampling time, Morrope, 2015. The sampling times corresponded to January, March and April months; indicated, as I, II, and III respectively.

Table 4

Determination (%) of protein and fat, on a dry basis, in samples the muscle tissue of the tail in *C. flavipunctatus*, Mórrope, 2015

	Sampling times			
Item	I	II	III	General
Protein	74.54	81.25	68.44	74.74
Fat	2.53	5.88	18.57	8.99

In spite of the laboratory made an analysis of composite samples (several specimens), it could not apply a statistical analysis.

Alligators are improving their body condition and accumulate more fat as time goes by, due to the hibernation characteristics, some opinions. The summer season is the key to this species, because increasing the availability of food. This way, alligator accumulate energy reserves and prepare a new hibernation period, as summer goes by and decreases the environmental temperature, improving its body condition, (Muñoz, 1994). Hunters take advantage of this behavior to gather up the tail's fat, because it has curatives properties leaving no scars.

According to previous evaluations of fat in bones yield, show the concentration of fat in a progressive increase from 2.53 % to 5.88 % until 18.57% toward the end of summer, according to previous evaluations. In addition, the presence of fat reserves was realized different amounts up to 46 g, mainly in female alligators during the process of gutting. The reproductive process is closely related with the greatest accumulation of energy, in the fat form, in female alligators, as well as other animal species.

There was an inverse, normal relation between the fat and protein content; when this relation comes fattier, the content of proteins decreases. In the first sample the content of proteins was of 74.54%, in the second one was 81.25% and the third sampling of muscle tissue 68.44%.

Table 5

There are three presentation forms in acceptance level (%) of the meat flavor in C. *flavipunctatus.*

Presentation	Classification of acceptance		
	Good	**Great**	**Excellent**
Chicharrón		42.9	57.1
Saltado	23.8	42.9	33.3
Pepián	33.3	38.1	28.6

The tasting was conducted by twenty-one people whom seventy percent of them were veterinary doctors and professionals from other careers related to the production or the use of animal food. They did not reject any different dishes. Everyone knew that it was *C. flavipunctatus* meat, which is important to avoid prejudice with regard to the acceptance to consume the product; however, for people who were not specialized in tastes, had difficulty to classify them because they indicated that the flavor of the meat is "good".

The distribution in contingency table 3 x 3 was carried out to apply the statistical analysis obtained from chi-square value of 9,068, which means 95% Confidence; pointing out a preference for one of these presentations, Figure N° 08 shows that the three presentations were statistically evaluated by diners who classified 57% Chicharron as "excellent" and 43% as "very good". Saltado classified as "excellent" decreased to 33% and Pepian 28.6%.

All diners said that the meat flavor was very good or excellent, and it could have good nutritional value and special properties beneficial to the health or welfare consumers.

The results were obtained from zootechnical characteristics, which shows similar bones yields with domestic animals except ruminants, it is possible to say that the studied specie is a predator and, it is an opportunistic generalist because of its eating habits, which allow its gastrointestinal tract to be relatively smaller than is whole body. The chemical analysis indicates that meat has a high protein content and, it could be a very good quality, as in all foods of animal origin. But, the most important is the high rate of acceptance of the meat by diners; this result has been based only on organoleptic (smell, taste, consistency, etc.) and not for the assumption about the health properties, which are attributed to the species; when people have health problems they might consume it for the beneficial effects, beyond that it can be unpleasant to the senses.

National Research Council (1991), in its specialized publication about Micro- Breeding, talks about a reptile which has cold-blooded; therefore, the consumers who has warm blood (human between them) they could not be affected by health problems. In addition, people from town and populations near to the rural sector claim that *C. flavipunctatus* is consumed with some intensity and it not presents health problems associated with its consumption; but it is necessary to perform health research to rule out or confirm it as a possibility.

The ability of tissue regeneration is a concern expressed in relation with the consumption of this meat, which is linked with the participation of certain lipids as the constitution, protection and regeneration of the cell membrane. It could be said to eat fat of the alligator would be supplied certain capable factors of regeneration.

First Sample. It is supposed that eating alligator meat some way could lead to the regeneration of tissues, avoiding the aging, it is a claimed desire by humans. The intentional loss of the alligator's tail is a survival strategy, which keeps moving strongly is to distract the predator in last instance and to have enough minimum time to hide; the loss of the tail is able to regenerate (Arnold, 1988; Meyer *et al.*, 2002; McConnachie y Whiting, 2003; Clause y Capaldi, 2006). This research worked with several specimens, which showed the loss of the end of alligator's tail, possibly to flee from predators, and it was determined that they were in the process of regeneration.

Conclusions

Alligator has a high performance of bones yield, high content of protein and which consumer in different preparation forms accepts.

Some zootechnical characteristics of alligator were influenced by the summer months and gender.

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"UCV-HACER" Rev. Inv. Cult. 5(2): 112-124.
ISSN PRAINTED: 2305-8552
July-December 2016. Campus Chiclayo, Lambayeque-Peru.
ISSN ELECTRÓNIC: 2414-8695