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Crecimiento del robalo y el chucumite en agua dulce en el estado de Veracruz, México

Growth of the snook and chucumite in fresh water in the state of Veracruz, Mexico

Crescimento de robalo e chucumite em água doce no estado de Veracruz, México

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Resumen

México cuenta con 1.5 millones de hectáreas de aguas protegidas y con características apropiadas para llevar a cabo el cultivo de diversas especies de peces marinos, entre las cuales se encuentran la *Centropomus parallelus*, conocido localmente como chucumite, y la *Centropomus undecimalis*, también llamado como robalo; ambas se distribuyen en la costa atlántica del continente americano, desde el extremo sur del estado de Florida, Estados Unidos, hasta el sur de Brasil.

Considerando el potencial para realizar las actividades de cultivo de estas especies en el estado de Veracruz, México, se llevó a cabo el presente estudio, el cual tuvo la finalidad de evaluar el crecimiento de ambas especies en estanques rústicos de tierra y de concreto.

Así, en ambos tipos de estanques se introdujeron crías de robalo y chucumite en una proporción de 3:2, durante un periodo de 14 y 12 meses, respectivamente, alimentándolos con especies forrajeras como la tilapia y los poecílidos.

En ambos casos, el crecimiento fue isométrico y el índice de mortalidad fue de 10 %, por lo que se arribó a la conclusión de que el cultivo del robalo y del chucumite puede desarrollarse en cautiverio en estanques de agua dulce tanto de tierra como de concreto, incluso colocando ambas especies de forma conjunta.

Palabras clave: acuicultura, chucumite, estanque de concreto, robalo.

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Abstract

Mexico has with 1.5 million of searched of waters protected (Arriaga *et. to the*. 2002) and features appropriate for carry to out the cultivation of various species of fish marine between which is are *Centropomus parallelus*, known locally as Chucumite and *Centropomus undecimalis*, called Snook, both is distributed in the coast Atlantic of the continent American, from the end South of the Florida, Used up to the South of Brazil.

Considering the potential to perform activities of cultivation of these species in the State of Veracruz, is led to out the present study, having as object the assess the growth of both species in ponds rustic of land and in ponds of concrete.

In both ponds is introduced offspring of *C. undecimalis* and *C. parallelus* in a ratio of 3:2, during a period 0f 14 and 12 months respectively, feeding them with species forage as the tilapia and Poeciliids.

In both cases the growth was isometric and the rate of mortality was of a 10%. The cultivation of C *undecimalis and C. parallelus* can develop are in captivity in ponds craft of Earth and/or of concrete in water sweet by placing both species of form joint. Is possible also provide food

Keywords: aquaculture, chucumite, pond of concrete, robalo.

Resumo

México tem 1,5 milhões de hectares de águas protegidas e com características apropriadas para levar a cabo o cultivo de várias espécies de peixes marinhos, entre os quais estão o parallelus Centropomus, conhecidos localmente como Chucumite, e robalo, também conhecidos como robalo ; ambos são distribuídos na costa atlântica do continente americano, do extremo sul do estado da Flórida, Estados Unidos, ao sul do Brasil.

Considerando o potencial para a agricultura atividades dessas espécies no estado de Veracruz, no México, foi realizado este estudo, que teve como objetivo avaliar o crescimento de ambas as espécies em tanques de terra rústicas e concreto.

Assim, em ambos os tipos de lagoas e fritar robalo Chucumite eles foram introduzidos numa proporção de 3: 2, durante um período de 14 e 12 meses, respectivamente, pela alimentação de espécies de forragem, tais como tilápia e poeciliids.

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Em ambos os casos, o crescimento foi isométrico ea taxa de mortalidade foi de 10%, então ele chegou à conclusão de que o cultivo do robalo e Chucumite pode desenvolver em cativeiro em lagoas de água doce terra e concreto , mesmo colocando as duas espécies juntas.

Palavras-chave: aquacultura, chucumite, lago de concreto, robalo.

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Introduction

Mexico has 1.5 million hectares of protected waters (Arriaga, Aguilar and Acolcer, 2002) and with appropriate characteristics to carry out the cultivation of various species of marine fish, among which are those that are agglutinated within the family Centropomidae . It should be noted that this family includes, in turn, two subfamilies: the Centropominae with a single genus Centropomus, which is distributed in tropical and subtropical coastal regions of the Atlantic and Pacific Ocean of the American continent, and the subfamily Latinae, with two genera Lates and Psammoperca, found only in Africa and the Indo-Pacific (Greenwood, 1976).

Rivas (1986), from 1874, in a systematic review of the genus Centropomus, corroborated only 12 of the 30 nominal species. Of this dozen, six species were detected on the Pacific coast and six on the Atlantic coast and the Gulf of Mexico. For its part, Centropomus parallelus (Poey, 1860), locally known as chucumite, is distributed on the Atlantic coast of the American continent, from the southern tip of the state of Florida, United States, to Santos, Brazil. In Mexico, specifically, its existence is known in the coastal states of Tamaulipas, Veracruz and Tabasco (Chávez 1963).

Also, the Centropomus undecimalis (Bloch 1792), locally called sea bass, is a widely distributed species on the Atlantic coast of the American continent, from South Carolina, United States, to Rio de Janeiro, Brazil. In Mexico, its distribution extends to all the coastal states of the Gulf of Mexico and the Caribbean Sea, that is, the species is common in Mexican waters and reaches great fishing importance; It abounds in the states of Tamaulipas, Veracruz and Tabasco (Chávez, 1963).

The fishing and aquaculture importance of both species is demonstrated by a pair of data obtained in 2004 and 2003, respectively: in Mexico, a catch of 8439 tonnes and 8086 tonnes of these spices was obtained (Secretaría de Medio Ambiente, Natural Resources and Fishing [Semarnap], 2008). Considering this potential to perform the culture activities of both species, specifically in the state of Veracruz, Mexico, the present study was carried out, which aimed to evaluate the growth of snook and chucumite in rustic earthen ponds and concrete in a freshwater environment.

Materials and methods

During the months of June and July of 2000 and February and March of 2001, 500 and 2500 young chucumite and snook, respectively, were caught in a beach chinchorro with a mesh size of 0.5 mm and 150 m in length. community known as "El Arbolillo", in the lagoon of Alvarado, Veracruz. This lagoon complex is located in the southern center of the state, between 18 ° 46' and 18 ° 42' of north latitude and 95 ° 42' and 95 ° 57' of west longitude; Its maximum width is 4.5 km, and it is oriented parallel from northeast to southwest with the coastline.

The 3000 captured fish, which recorded an average of 5.5 cm of total length and 1.2 g of weight, were acclimated during 40 days in 6 concrete ponds of 4 mx 4 mx 1 m, at a temperature of 29-30 ° C, with dissolved oxygen of 5.0-6.0 mg / l and a pH of 7.0, at the Centro Integral Acuicola Continental, located in the town of "La Piedra" in Alvarado, Veracruz, 20 km from Boca del Río.

In August 2000, 500 pups of Centropomus undecimalis (robalo) and Centropomus parallelus (chucumite) were planted in a ratio of 3: 2, in a rustic pond of 25 m x 10 m x 1.2 m. In April 2001, another 200 were planted in a concrete pond measuring 8 m x 8 m x 1.5 m. Prior to sowing, a selection of the offspring was made by size and species, presenting on average 7.2 cm of total length and 2.0 g of weight for the snook, while for the chucumite 5.9 cm and 2.3 g of weight in the rustic pond ; In the concrete, meanwhile, an average of 13.8 cm of total length and 28.9 g of weight for the snook and of 8.8 cm and 5.6 g of weight for the chucumite were recorded.

In the case of the rustic pond, the feeding was from live food in a permanent way, namely, Oreochromis niloticus (Linnaeus, 1758) of 15 cm of total length and a weight of 130 g for the

males and of 12 cm and 100 g for the females, in a proportion of two females for each male, making a total of 15 reproducers.

For the concrete pond, feeding was ad libitum during the entire study, which lasted 12 months, based on tilapia pups and ornamental fish (Poecila sphenops). The pond was checked daily, eliminating the remaining food.

Statistic analysis

For the analysis of the length-weight relationship in each species of this study, we used the semilogarithmic model represented in the following way: W = aLb, where W is the weight in grams of the organism at a certain age, L is the length in centimeters at the same age and a and b are the estimators of the function, b being the indicator of isometric growth.

For the estimation of the growth curve for size and weight, an incomplete gamma model was used, represented as follows: Y = aebt, where a is the origin, e is the base of the natural logarithm, namely, 2.71828, b is the slope and t is the age in months.

The absolute growth rate in weight (grams) (TACP) and total length (centimeters) (TACL) were estimated from the difference between the final and initial measurement, while the daily growth in height and weight was estimated dividing total growth by the number of study days (Álvarez y Hernández, 2001).

Results

The physicochemical parameters of temperature, dissolved oxygen, pH and salinity on average remained without significant differences both in the concrete pond and in the rustic one (see table 1).

Tabla 1. Parámetros fisicoquímicos en un estanque de concreto durante 12 meses y en un estanque rústico en 14 meses en Alvarado, Veracruz

Parámetros fisicoquimicos	Estanque de concreto	Estanque rústico
Temperatura	27.3 °C	29 °C
Oxígeno disuelto	5.77 mg/l	4. 5 mg/l
pH	7.0	7.0
Salinidad	0.0	0.0

Fuente: Elaboración propia

In the rustic pond, after 14 months of harvesting, the species of snook presented, on average, a total length of 34.6 cm ± 0.21 cm and a weight of 212.5 g ± 6.7 g; while for the chucumite it was 18.6 cm ± 0.21 cm and 58.9 g ± 5.04 g, respectively.

As for the concrete pond, the total average length for the snook was 17.3 cm ± 0.74 cm and 183.6 g ± 2.02 g of weight; while for the chucumite the length was 14.9 cm ± 2.6 cm and the weight was 118.1 g ± 1.38 g (see table 2).

Tabla 2. Índices de crecimiento para el robalo y el chucumite en un estanque de concreto durante 12 meses y en un estanque rústico durante 14 meses en Alvarado, Veracruz

Tipo de estanque	Robalo	Chucumite
Estanque de concreto		
Longitud promedio t**otal (cm)**	17.3 ± 0.74	14.9 ± 2.6
Peso (g)	183.6 ± 2.02	118.1 ± 1.38
Estanque rústico		
Longitud promedio **total (cm)**	34.6 ± 0.21	18.6 ± 0.21
Peso (g)	305.5 ± 5.04	58.9 ± 5.04

Fuente: Elaboración propia

The length-weight ratio in the rustic pond for snook was W = 0.00726228L2.9543 and for the chucumite it was W = 0.00858913L3.0144. The value of the slope (b), close to three, indicates an isometric growth (Ricker 1968, Lagler, Bardach, Miller and May, 1990).

A similar result was presented in the concrete pond, since the relation for the snook was W = 0.00678173L3.02 and for the chucumite it was W = 0.00589367L3.13 (see table 3).

Tabla 3. Relaciones de crecimiento para el robalo y el chucumite en un estanque de concreto durante 12 meses y en un estanque rústico en 14 meses en Alvarado, Veracruz

Especies	Longitud	R^2	Peso	R^2	Relación longitud-peso
Estanque de concreto					
Robalo	$15.237e^{0.063x}$	93 %	$29.32e^{0.1798x}$	96 %	$W = 0.00678173L^{3.02}$
Chucumite	$9.4687e^{0.085x}$	91 %	$6.62e^{0.2735x}$	92 %	$W = 0.00589367L^{3.13}$
Estanque rústico					
Robalo	$5.2726e^{0.139\ x}$	97 %	$0.9282e^{0.276\ x}$	96 %	$W = 0.00726228L^{2.9543}$
Chucumite	$4.4014e^{0.104\ x}$	90 %	$0.8494e^{0.285\ x}$	91 %	$W = 0.00858913L^{3.0144}$

Fuente: Elaboración propia

The average mortality was 10% for both ponds, same for the two species.

Finely, the daily average growth in size and weight in the rustic pond was 0.047 cm and 0.50 g for the snook and for the chucumite of 0.041 cm and 0.32 g.

Discussion

From the physicochemical parameters of both ponds, we can mention that in the case of the rustic pond the temperature presented during the 14 months an average of 29.6 ° C ± 3.35 ° C, increasing in the period from March to September, when registering a temperature above 30 ° C; on the other hand, in the concrete one it was 27.7 ° C, increasing in the period from April to July above 30 ° C.

Tucker (1987) reported that juveniles of snook maintain a good appetite at temperatures of 26-32 ° C and that they stop eating below 26 ° C. Later, Tucker (2001) noted that the optimum temperature for the development of snook is 27-28 ° C and can survive in a range of 10-35 ° C.

Muhlia, Arvizu, Rodríguez, Guerrero and Gutiérrez (1994) point out that the temperature range of 25-29 ° C is the optimum for the normal development of snook.

In conditions of culture in salty and brackish water, the temperature varies remarkably. Okada (1980) reports fluctuations of 25.5-30.5 ° C. While fluctuations of 25.7-30.6 ° C are mentioned in a study carried out jointly by Maia, Rocha and Okada (1980). Likewise, Rocha and Okada (1980) report fluctuations of 26.9-31.8 ° C; and, finally, Millán (1989) of 26.5-29.0 ° C. For all the above, we can say that the optimal temperature for fattening young snook and chucumite is 20-34 ° C.

On the other hand, the pH remained stable in both crops, between 6.9 and 7.2. And the amount of oxygen dissolved in the water ranged from 4.1-6.9 mg / l, which, according to Tucker (1987), Peterson and Gilmore (1991) and Muhlia et al. (1994), can be considered optimal. Although not so for other authors, such as Okada (1980), who reports variations of 2.8-4.5 / ppm; Rocha and Okada (1980) also mention variations of 0.6-4.5 / ppm and of 3.8-5.0 / ppm, and Millán (1989) of 4.3-6.2 / ppm.

Also, it is confirmed that these are two species resistant to management, since the survival of the fish during both 14 and 12 month experiments, respectively, was 90%.

In both experiments, keeping them in freshwater conditions allowed them to have an isometric growth, according to Ricker (1968) and Lagler (1990), with values of slope b close to three, since in the first experiment the value for the snook it was 2.9 and for the chucumite of 3 and for the second it was 3.0 and 3.1, respectively.

The growth of snooks was greater in the freshwater environment, since the energy cost due to osmoregulation is lower, together with a temperature, pH, and optimal dissolved oxygen that allow growth, as well as an adequate diet.

This is why it is a native species that has been considered as a potential for its incorporation into aquaculture by several authors (Carvajal, 1975, Ager, Hammond and Ware, 1976, Shafland and Koehl, 1979, Rocha and Okada, 1980; Chapman, 1982, Lau and Shafland, 1982, Tucker, 1987, 1988, 1989, Tucker and Jory, 1991, Amador and Cabrera, 1991, 1994, Amador, Gómez, Barrera and Cabrera, 1995, Amador and Cabrera, 1996, Amador, Cabrera and Gomes, 1997, Cabrera and Amador, 1997, Della Patron, 1988).

The culture of snook and chucumite can be developed in captivity in freshwater and freshwater concrete artisanal ponds, even placing both species together. It is noteworthy that for this purpose it is also possible to provide live food, using forage species such as tilapia or poecilids.

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