Aquaculture of the Sciaenidae family: main species cultivated worldwide and emerging species in Latin America.

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INTRODUCTION

The deficit of fisheries resources, the increase in the world population and the growing per capita consumption of fish (20,5 kg 2020), are some of the factors that have led to greater investment in world marine fish farming. The statistics for 2019 presented a consolidated and growing Atlantic salmon (*Salmo salar*) industry, with the highest world production (2.615.962 tons) of a species cultured in the sea. In addition to salmon, other marine fish present significant advances in technological development with productions greater than two hundred thousand tons, European seabass (*Dicentrarchus labrax*) 263.214 tons, gilthead seabream (*Sparus aurata*) 258.753 tons, and the large yellow croaker (*Larimichthys crocea*) 225.547 tons. These advances have encouraged interest in culturing new species in regions that have little tradition of marine aquaculture, such as Latin America. The Sciaenidae family made up of 289 species in 69 genera, presents in addition to the large yellow croaker, several species with important productions and other species with high potential for culture. This work compiles the main factors of success and problems generated in the aquaculture industry of Sciaenidae and also makes reference to the state of technological development and future perspectives of emerging species of the Sciaenidae family in Latin America.

GLOBAL PRODUCTION AND ECONOMIC VALUE

The world production of species the family Sciaenidae has been dominated by fishing extraction since before 1950, reaching a maximum catch in 2012 (1.940.285 tons), but over the next seven years declined by 387,922 tons, reaching a total production of 1.552.363 tons in 2019. Unlike fishing, the aquaculture of the Sciaenidae family increased significantly during this period (Fig. 1).

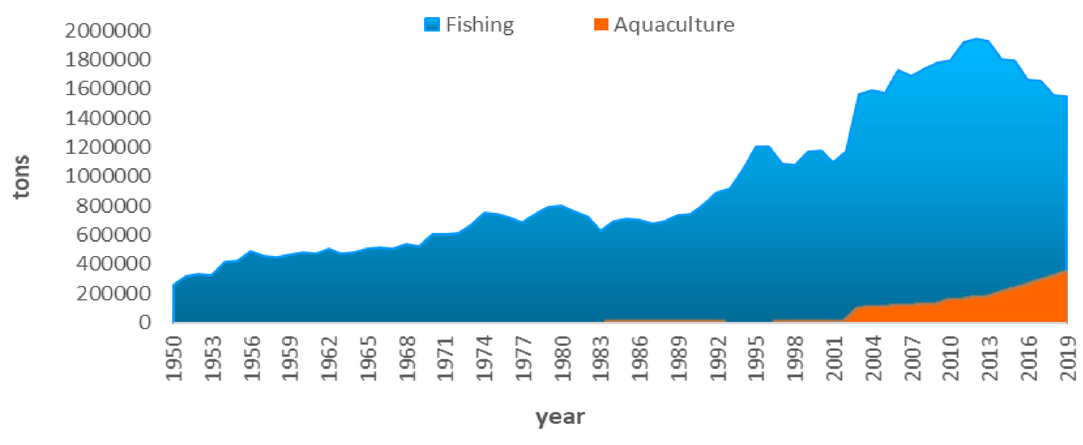

Fig 1: Global production of the family Sciaenidae by fisheries and aquaculture according to FAO statistics (1950-2019).

The family Sciaenidae represents one of the groups of marine fish (fully marine from egg through to adult) with the highest production in the world (340.273 tons - 2019) with a high market value of 839.569.920 U.S. dollars. Three species contribute 99,94% of the world aquaculture production of the Sciaenidae family, the large yellow croaker, *L. crocea*, cultured in China (225.549 tons – 66,28%), the red drum, *Sciaenops ocellatus* (77.008 tons – 22,63%) cultured in the USA, China, Guadeloupe, Israel, Martinique, Mauritius and Mayotte, and meagre, *Argyrosomus regius* (37.526 tons – 11,03%), cultured in Egypt, Spain, Greece, Turkey, Croatia, France, Saudi Arabia, Italy, Tunisia, Cyprus, Portugal, and Algeria. The remaining 0,06% (189,6 ton), was contributed by the Shi drum, *Umbrina Cirrosa* cultured in Greece and Turkey, the mi-iuy croaker, *Miichthys miiuy* cultured in the Republic of Korea, and the mulloway, *Argyrosomus japonicus* cultured in Mauritius.

Table 1: Countries and continents with higher production of the family Sciaenidae 2016-2019

	% Production					Ton.
Country	*2016-2019*	*2 016*	*2 017*	*2 018*	*2 019*	*2016-2019*
1. China	88,0	227 460,0	246 199,0	266 233,0	295 736,0	*1 035 628,0*
2. Egypt	7,9	16 162,0	25 013,0	25 130,0	25 320,0	*91 625,0*
3. Spain	1,1	1 707,3	3 523,7	3 929,2	4 534,9	*13 695,1*
	% Production				*value $ U.S.*	*Ton.*
Continent	*2016-2019*				*2019*	*2016-2019*
1. Asia	88,5	230 180,0	247 273,0	268 099,0	299 675,0	662 230 190,0	1 045 227,0
2. Africa	8,4	16 948,0	26 277,0	27 171,0	28 812,0	106 904 390,0	99 208,0
3. Europe	2,3	5 080,4	6 488,9	7 167,3	8 486,7	50 617 910,0	27 223,4
4. America	0,8	1 388,6	1 219,8	3 305,8	3 299,6	19 817 430,0	9 213,9
5. Oceanía	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total	100,0						1 180 872,2

Statistics taken from FAO. 2021. Fishery and Aquaculture Statistics. Global aquaculture production 1950-2019 (FishstatJ). In: FAO Fisheries and Aquaculture Department [online]. Rome. Updated 2021. www.fao.org/fishery/statistics/software/fishstatj/en

SUCCESS FACTORS AND PROBLEMS

The three Sciaenidae species with the highest production in the world have shown high potential for aquaculture. They stand out for being euryhaline species (0-66 ppt), eurythermal (2-38 °C) and have high fecundity that allows them to produce large quantities of eggs per spawn (500-3.270.000). Red drum can spawn naturally and reproductive dysfunctions have been overcome with hormonal therapies, for example in red drum (GnRHa 100-160 µg + HCG 5 mg kg^{-1}), and with low doses in L. croceus (GnRHa 3-10 µg kg^{-1}) and in A. regius (GnRHa 15 µg kg^{-1}). Survival has been achieved in larval culture between 7,7 and 75% and growth rates in grow-out of 2,14 g/day^{-1}, with low feed conversion rates between 0,9 and 1,9. High larval survival rates have been correlated to the use of copepods for food in some species. Market values range between $ 7,14 – 14,28 U.S. dollar, which are attractive and have allowed the profitability of aquaculture production. The Sciaenidae are species susceptible to handling. The little progress in the production of secondary species may be related to several factors. In the case of *U. cirrosa*, its industry is considered to be overshadowed by the good characteristics and success of the culture of *A. regius*. In *M. miuuy* and A. japonicus, technological problems are reported for the production of larvae and juveniles.

EMERGING SPECIES INVESTIGATED IN LATIN AMERICA

In Latin America there has been great interest in the development of aquaculture for the Sciaenidae family since the late 20th century. Research on eleven species are currently reported (Fig. 2). Two have greater technological development, the totoaba *Totoaba macdonaldi* and the corvina pampera *Cilus gilberti*. The other species are in the initial stages of technological development or have been studied sporadically

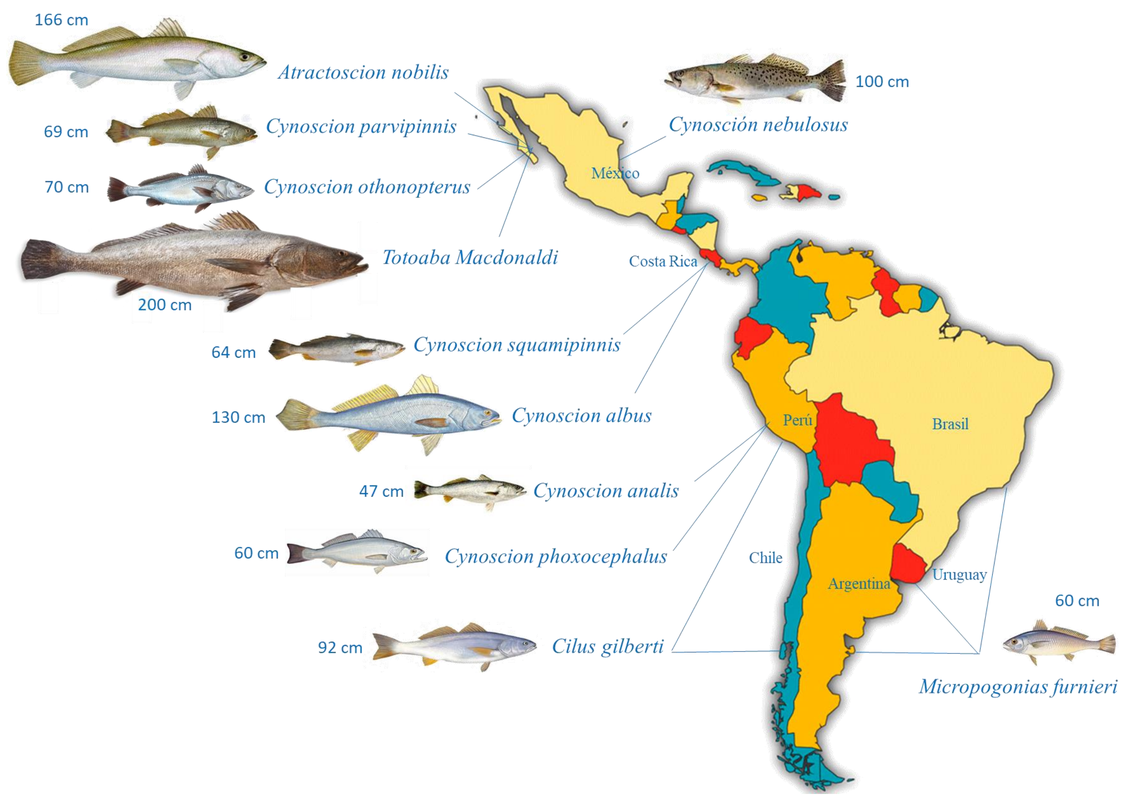

Fig 2: Species of the Sciaenidae family investigated and / or cultivated in Latin American countries during recent decades (90s – 2010s). Maximum full-length data taken from Froese, R. and D. Pauly. Editors. 2021.FishBase. World Wide Web electronic publication. www.fishbase.org, (06/2021)

CONCLUSIONS

The Sciaenidae family has the highest world aquaculture production of a marine species group, with biological characteristics that give high potential for aquaculture. The three consolidated species have in common that previously developed culture technologies were quickly and easily adapted for their production, allowing high larval survival rates and spawning of consistent quality, using when needed established GnRHa hormonal therapies to overcome reproductive dysfunctions. Latin America has a high interest and potential to develop aquaculture with species of the Sciaenidae family. It is recommended for the Latin American region to analyze the technologies used for these established Sciaenidae to apply these technologies to native Latin American Sciaenidae to both utilize successful management aspects and avoid problems encountered.

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