ANNUAL REPORT
CSARP-2020

THE CHILEAN SALMON ANTIBIOTIC REDUCTION PROGRAM

WWW.CSARP.CL

INTRODUCTION

•The mission of the Monterey Bay Aquarium is to inspire conservation of the ocean. The waters of the Patagonia support diverse aquatic and terrestrial ecosystems, which thousands of people in communities across Chile depend on. These waters also support the Chilean salmon farming industry, which produces nutritious food for the world and is a major economic contributor to the Chilean economy.

> *Never before has our industry made such a bold commitment*
>
> **A. Clement, CEO SalmonChile**

The Chilean Salmon Antibiotic Reduction Program (CSARP) is an initiative between the Monterey Bay Aquarium Seafood Watch program and the Chilean salmon farming industry to reduce antibiotic use by 50% by 2025. The program is part of a broader collaboration to improve production practices and reach a Seafood Watch Good Alternative recommendation

Improvement at this scale is excellent news for Patagonia,and for everyone around the world who enjoys Chilean salmon. Collaboration between all stakeholders – industry, conservation, communities, businesses and consumers – will be instrumental in reaching our shared goals. We're proud to support this work and are excited to see real change as we progress towards 2025.

Never before has our industry made such a bold commitment. We are excited to work together as an industry and with the Monterey Bay Aquarium to fulfill this extremely important goal. We have made significant advances in salmon farming over the past four years and always work to minimize the use of antibiotics. Collaborating to further this work is a major step we can take toward continuous and quantifiable improvement.

Arturo Clement
C.E.O SalmonChile

Jennifer Dianto Kemmerly
Vice president; Global Ocean Initiative
Monterey Bay Aquarium Seafood Watch

Photography: Pamela Alchao ©

Chilean Industry in Numbers

Chile is currently the world's second-largest producer of farmed salmon with a harvest over 950,000 metric tons in 2019. Salmon farming is the primary economic activity in the southern region of Chile and accounts for 7% of the country's total exports, second only to mining. The rapid growth of the industry in the 1980s allowed for consolidation of Chilean salmon supply in international markets and the industry has continued to grow since.

Atlantic salmon is the main species produced in Chile (73%), followed by coho salmon (19%) and rainbow trout (7%) (Figure 1).

Roughly 450 farm sites are active each year, distributed between Los Lagos (Region X), Aysen (Region XI) and Magallanes (Region XII) in the southern territory of Chile (Figure 2)

The United States is the primary export market for Chilean salmon, totaling 36.4% of export revenues. The main product exported to the United States is fresh Atlantic salmon fillet. Japan, Brazil, Russia and China are also among the top five export markets, with frozen Atlantic salmon as the main product sold. (Figure 3).

Average closed-cycle mortality rates in the industry are typically lower than 15%, only exceeding this once in the last five years, attributable to the toxic algae bloom which took place in early 2016.

Salmonid rickettsial septicemia (SRS), the main bacterial disease, caused mortality of <1% in 2019 and has progressively declined since 2015 (Figure 4).

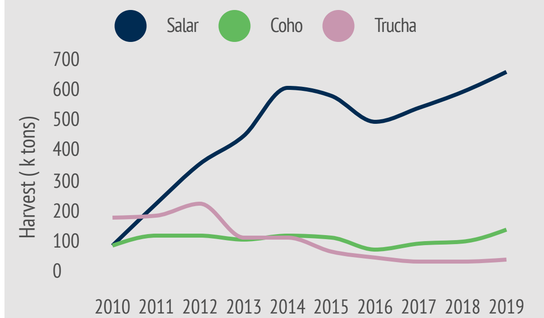


Fig 1. Harvest evolution industry level

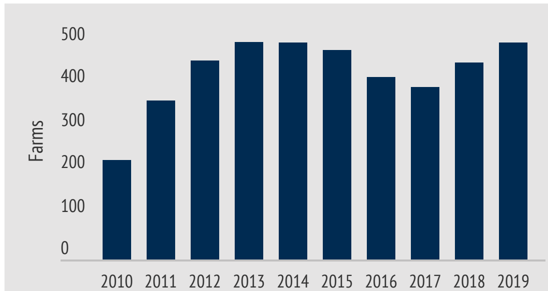


Fig 2. Site evolution at industry level

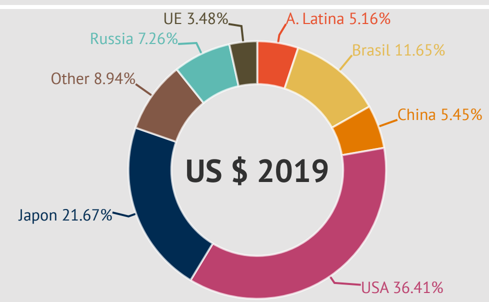


Fig 3. Mains markets at industry level

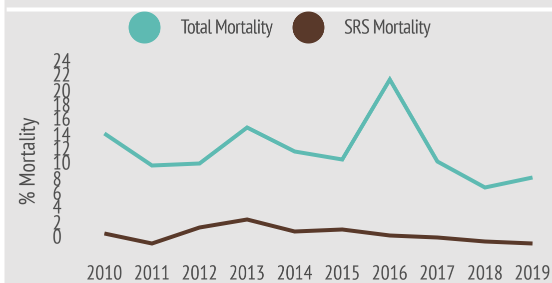


Fig 4. Total and SRS mortality rate

CSARP

THE CHILEAN SALMON ANTIBIOTIC REDUCTION PROGRAM

Scope and Milestones

CSARP is a voluntary program with the objective to reduce the usage of antibiotics in chilean salmonid farming by at least 50% by 2025. This program was developed as part of a broader collaborative agreement between the Monterey Bay Aquarium Seafood Watch program and SalmonChile to increase the ecological sustainability of salmonid farming in Chile by implementing improved production practices to a level equivalent to a SFW Yellow rating of "Good Alternative" by 2025.

The program has defined specific guidelines at different levels (site, neighborhood, industry) to reduce the consumption and ecological impact of antibiotic use in the Chilean salmon industry. In addition, CSARP has identified various knowledge gaps to be addressed in collaboration with academic institutions and researchers to further the scientific understanding of the ecological impacts and performance gaps of Chilean salmonid aquaculture.

Governance Structure

The program has established a has a Board of Directors consisting of two members from the Monterey Bay Aquarium, the president of SalmonChile and a CEO of a salmon production company. The Board has established a Technical Advisory Committee (TAC) to provide recommendations on how to best achieve the objectives set out in the program.provide scientific advice and recommendations to the Board, in support of the program goals and objectives. The TAC is comprised of veterinarians, business managers, independent scientists, the Chilean Salmon Marketing Council and representatives of SFW and INTESAL and members are appointed annually. Both the Board and TAC will have in-person meetings at least a year.

Members

The program members include 17 salmon farming companies, equivalent to 100% of Atlantic salmon, and coho salmon production, and 70% of rainbow trout. The biomass produced by the project partners is equivalent to 97% of total annual salmonid harvested in Chile, based on 2019 harvested data. See Fig 5.

Member companies include: Cermaq, Cooke, Yadrán, AquaChile, Marine Farm Multiexport Foods, Salmones Austral, Salmones Blumar, Salmones Camanchaca, Ventisqueros, Caleta Bay, Australis, Mowi, Novaustral, Salmones Aysen, Salmones de Chile and Invermar.

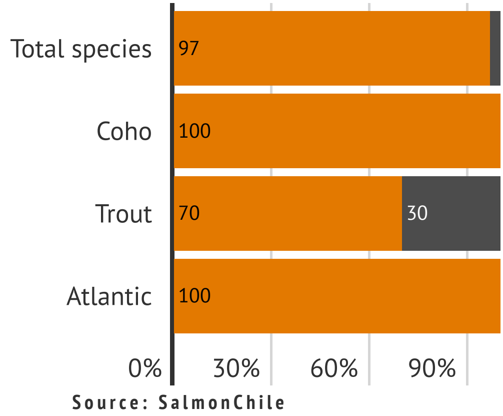


Fig 5. Total Biomass harvested by CSARP members, based on 2019 statistics.

Signature members include SalmonChile, the Chilean Salmon Marketing Council and the Monterey Bay Aquarium Seafood Watch program. INTESAL, the technological salmon institute under SalmonChile, will manage the data and web services provided from the program.

Farmers companies members

CERMAQ

australis SEAFOODS

Ventisqueros Best in class performance

BLUMAR SEAFOODS

Nova Austral PURE SALMON FROM ANTARCTIC WATERS

Camanchaca

Marine Farm

Salmones Austral

AQUACHILE

INVERMAR

salmones Aysén

MOWI

YADRAN HIGH QUALITY SALMON

Multiexport Foods

SALMONES DE CHILE

CALETA BAY

Cooke AQUACULTURE CHILE

Results

Identification of Research Gaps

Antibiotics are widely used in animal production for therapeutic purposes. However, in many animal production systems the impact on the environment and public health is not well understood. This knowledge gap is much more evident in salmon aquaculture; the marine aquatic environment is a complex set of biotic components and interactions. and the effect of antibiotic pollution on these components and interactions is poorly characterized.

In addition, there is a lack of a validated, consistent methodology by which to develop and conduct research.

Similarly, although it has been possible to establish certain empirical information with regard to the risk and protective factors that influence the use of antibiotics, knowledge gaps remain that must be addressed in order to implement additional measures to reduce antibiotic use effectively. Knowledge gaps identified by the T.A.C are summarized in Table 1.

Table 1.1: Gap knowledge to reduce the use of antibiotic in the chilean salmon industry

Level	Research GAP
Industry	Determine the factors and metrics that determine that good smolt quality before sea transfer.
Neighborhood	Identify and categorize by importance health and management practices involved in high or low consumption of antibiotics
Population	Study performance of fish families selected for SRS resistance status and projection of the generation of resistant fish and its impact on disease control.
Industry	Know the potential of coho salmon in non-traditional markets to boost production
Neighborhood	Establish the operational risk of neighborhoods configuration and operations using epidemiological models
Industry	Evaluate the cost-benefit of the measures implemented for the control of SRS and Caligus and the potential effect of future TAC recommendations.
Industry	Establish the capacities needed in freshwater to increase the smolt weight before sea transfer and shortening of the length of production cycles in seawater
Industry	Establish the duration and efficacy of field vaccines
Site	Prospect technologies for the effective control and mitigation of predator attacks.
Industry	Know the impact of the legislation on the consumption of antibiotics and the effectiveness of incentives/penalties regulations
Industry	Establish rules for sharing and distributing information without compromising free competition

Table 1.2 : Gap knowledge to reduce the impact of antibiotic in the chilean salmon industry

Level	Research GAP
Site	Determinants of a good and poor antibiotics performance site.
Neighborhood	Establish a neighborhood carrying capacity applied and associated disease risk
Site	Understand practices to determine the ecological impact of antibiotic use.
Site	Determinate the best metric to asses the impact of antibiotics use.
Site	Know the Impact of food and feces over antibiotics seabed dinamic
Site	Know pharmacokinetics and dynamics of the antibiotic on the seabed
Industry	nTo find New antibiotics without impact on environmental and no critical regarding WHO
Industry	Methodology to estimate the impact on sediments
Site	Establish Impact mitigation actions
Neighborhood	Assess effect of early harvest on Antibiotics index.

Recomendation to Reach CSARP Objetives

On July 2019, the first meeting of the CSARP TAC was convened in Puerto Varas, Chile. The objective of the meeting was to establish initial metrics for monitoring and reporting antibiotic use and how to achieve a Seafood Watch Good Alternative level of environmental sustainability. Main recommendation are summarized in Table 2.

Main recommendations for reducing antibiotic use include: Increasing distances between farms, implementing an adequate vaccination strategy, early diagnosis and treatment, decreasing fish exposure to pathogens by shortening the length of production cycles at sea, more effectively controlling of sea lice infections, prioritizing injectable antibiotics over oral administration, controlling dose and treatment duration, improving smolt quality and reducing stress conditions in fish.

Table 2.1: Recommendation by Technical Advisor Committee to reach CSARP objective at site level.

Recommendation
Increase the distance between farms
Effective vaccination Strategy
Diagnostics and treatment training program
Stocking a proper density
Timely treatment / diagnosis
Increase smolt quality
Reduction of fish exposure to pathogens.
Caligus Control
Use of injectable, oral treatments
Optimize antibiotics dose
Runt control
Use of genetically SRS resistant fish
Control of predators

Table 2.2: Recommendation by Technical Advisor Committee to reach CSARP objective at neighborhood.

Recommendation
Strategic stocking
Health Coordination Strategy
Use epidemiological models to the stablish carrying capacity

Table 2.3: Recommendation by Technical Advisor Committee to reach CSARP objective at Industry level.

Recommendation
Collaborative actions between companies and differents health initiatives
Collaborative actions with the health authority
Rethinking the neighborhood system based on epidemiological information.

Photography: Pamela Alchao ©

CSARP Main activities during 2019

During 2019, different activities were carried out to meet the objectives established in the program and the commitments made in our M.O.U. The results are summarized in the next figure

Technical

•6 Technical meeting between Seafood Watch and INTESAL (Chile and U.S.A)

•1 Technical Advisory Committee (Chile)

•A Comprehensive Antibiotic database including data from 17 companies ~97% of Chilean salmon production

Academics

•Technical advisory committee recommendation report

• Research needs to reach Seafood Watch recommendation equivalent to Good Alternative by 2025

• A Ph.d. research to for treatment economics assessments

• A senior fellow on aquaculture sustainability

Administrative

•A MOU signed

• A Governance structure

• 1 Board meeting

Transfer

• 4 Seminar/conference (2 Chile; 1 USA; 1 The Netherland)

• A CSARP Webpage

Data collection process

Metrics

The TAC established that consumption of antibiotics expressed in grams of active ingredient per ton of harvested closed-cycle salmon will be the initial metric used to assess reduction; the baseline year is salmon harvested in 2017, excluding cycles that were active in 2015 and those influenced by algae-related mortality during the toxic algae bloom in 2016. Additional metrics, such as treatment frequency, will also be recorded and considered for use in tracking progress and measuring impact.

Data collection

In February 2020, the program collected antibiotic use data at the site level from CSARP member companies, including the type of antibiotic, dose, duration of therapy and biomass treated, representing antibiotic consumption during the 2017-2019 period.

This report considering information from 17 companies and 616 close cycles.

Validation process

Data submissions were curated following INTESAL protocols to ensure the accuracy of data. Data were codified to safeguard confidentiality and comply with anti-trust regulations. Data transmission and storage is managed under a confidentiality agreement between member companies and INTESAL. A copy of cured database was transferred to The Monterey Bay Aquarium Seafood Watch for a second independent validation process.

Data were validated through comparison with internal INTESAL data, aligned with data submitted to and published by the National Fisheries Service (Sernapesca) in Chile and other private sources.

RESULTS

At industry level

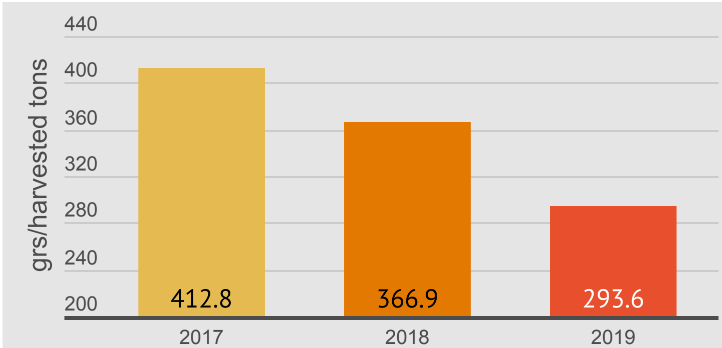


Fig 6. Antibiotics consumption at industry level

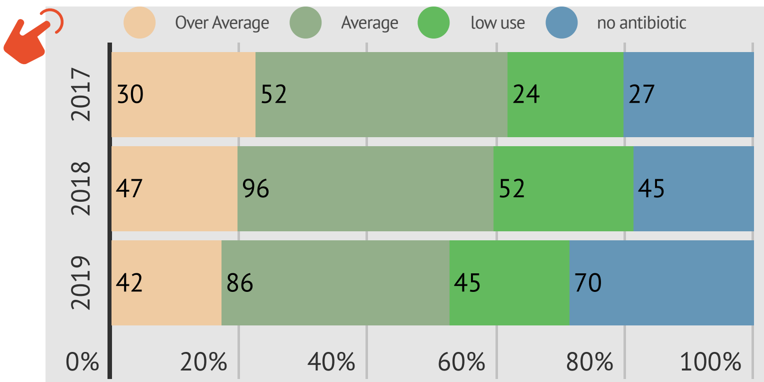


Fig 7. Distribution on antibiotics use, according the low, on average, high and non antibiotic use

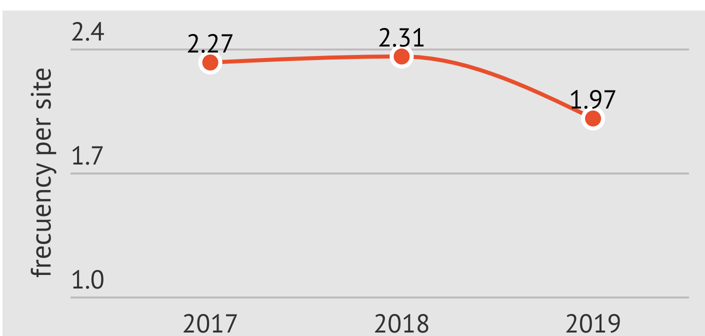
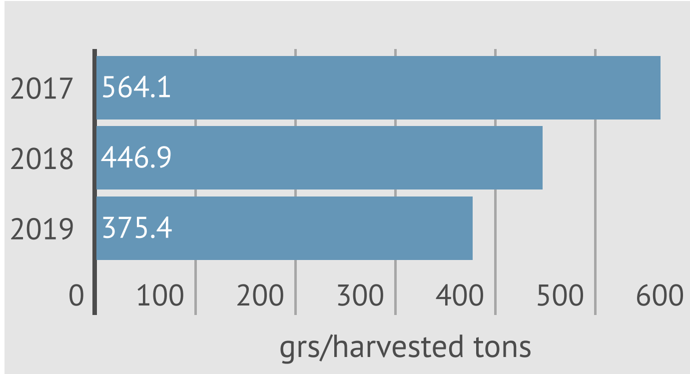


Fig 8. Antibiotic use frequency at site level

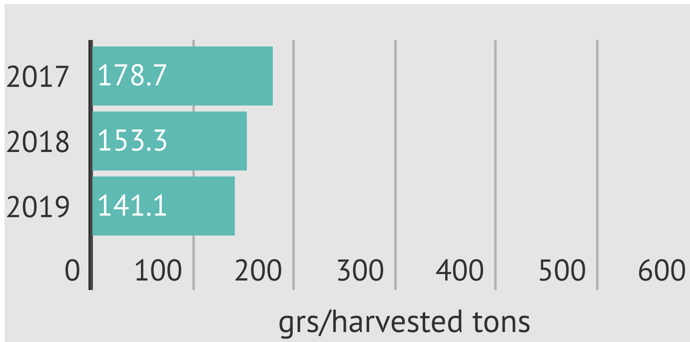
RESULTS

At level species

Atlantic Salmon



Rainbow Trout



Coho Salmon

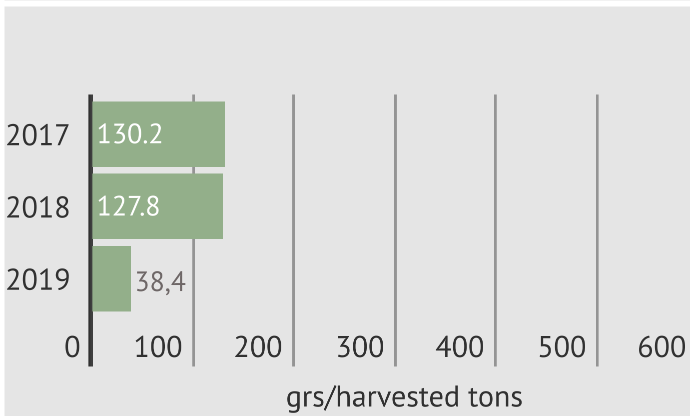


Fig. 9 Antibiotic use evolution at species level

RESULTS

At region level

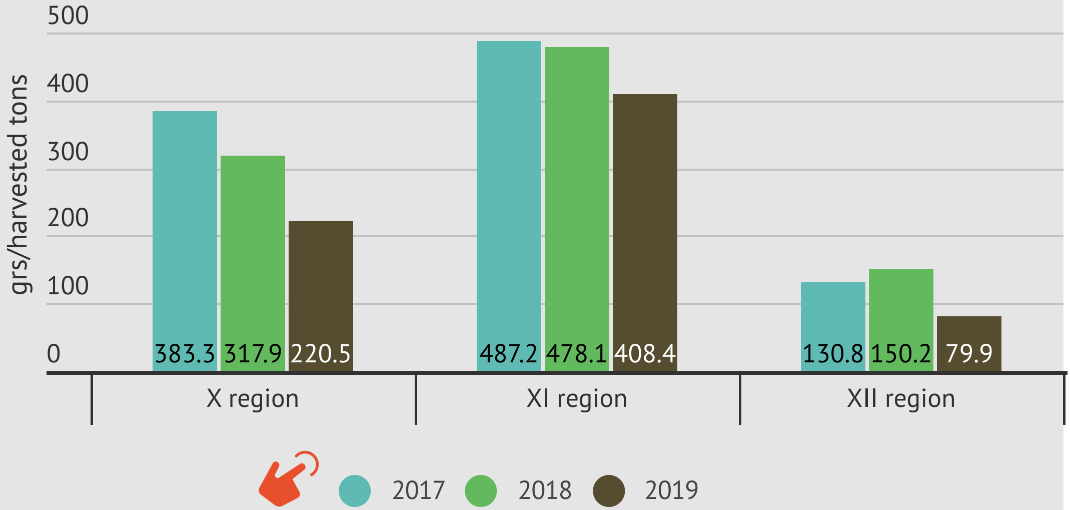


Fig 10. Antibiotic consumption at region level

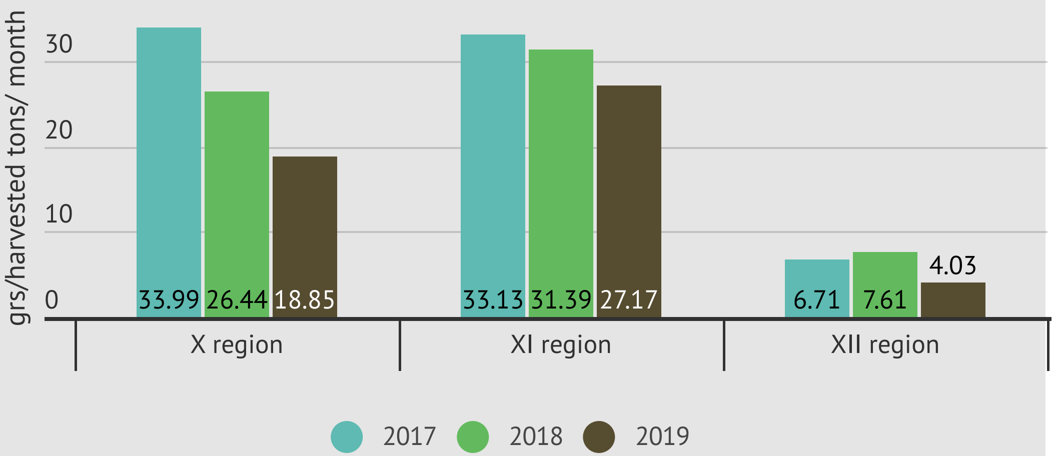


Fig 11. Standard antibiotic index at region level

RESULTS

At neighborghood and region level *

Table 3.1: Antibiotics consumption at neighborhood level close periods for X region (Los Lagos)

Neighborhood	Productive Period	ICAB PC	ICAS	Number of cycles
1	Abril2017-Diciembre2018	134,4	16,0	29
2	Abril2017-Diciembre2018	302,3	24,5	34
3A	Enero2018-Agosto2019	76,8	8,0	7
3B	Mayo2016-Abril2018	372,3	30,7	9
6	Agosto2017-Abril2019	16,1	1,1	2
7	Abril2017-Diciembre2018	246,9	24,1	8
8	Marzo2018-Octubre2019	338,8	28,5	10
9A	Julio2016-Marzo2018	218,9	17,4	13
9B	Abril2018-Diciembre2019	752,4	47,8	4
9C	Octubre2017-Junio2019	202,5	13,5	3
10A	Mayo2016-Enero2018	305,6	21,6	15
10B	Febrero2018-Octubre2019	470,7	31,1	8
11	Abril2017-Diciembre2018	140,6	12,6	19
12A	Agosto2016-Abril2018	196,2	17,7	10
12B	Agosto2016-Abril2018	746,4	41,5	2
14	Octubre2017-Septiembre2019	372,2	25,8	5
15	Noviembre2016-Julio2018	279,2	16,1	3
16	Junio2017-Febrero2019	388,9	26,5	9
17A	Agosto2016-Abril2018	529,7	40,5	13
17B	Abril2017-Diciembre2018	326,1	25,1	7

* *only neighborhoods with closed periods between 2017-2019 have been considered.*

ICAB PC: Antibiotic consumption index at Neighborhood level(ICAB): grams of antibiotics in active ingredient / tons harvested during the neighborhood periods.

ICAS: Antibiotic consumption index at Neighborhood level(ICAB): grams of antibiotics in active ingredient / tons harvested during the neighborhood periods/ productive months of the neighborhood

RESULTS

At neighborghood and region level *

Table 3.2: Antibiotics consumption at neighborhood level close periods for XI region (Aysen region)

Neighborhood	Productive Period	ICAB PC	ICAS	Number of cycles
18A	Marzo2016-Febrero2018	414,3	25,9	3
18B	Julio2016-Marzo2018	341,4	27	3
18C	Febrero2017-Octubre2018	512,6	30,2	10
18D	Enero2018-Septiembre2019	738,6	53,8	11
19A	Noviembre2016-Julio2018	435,4	28,3	10
19B	Octubre2017-Junio2019	686,4	40,4	2
20	Noviembre2017-Julio2019	382,3	22,8	10
21A	Septiembre2017-Agosto2019	406,9	25,4	8
21B	Julio2017-Junio2019	430,1	30,6	13
21C	Diciembre2016-Noviembre2018	691,7	41,4	11
21D	Abril2018-Diciembre2019	393,4	29,5	3
22A	Abril2017-Marzo2019	686,4	38,1	4
22B	Mayo2016-Marzo2018	386,8	23,2	3
22C	Septiembre2016-Julio2018	586,1	43,4	4
22D	Junio2017-Mayo2019	424,2	27,8	8
23B	Mayo2017-Abril2019	63,9	3,8	1
23C	Enero2018-Diciembre2019	522,4	29,4	5
24	Abril2016-Marzo2018	643,6	40,2	5

* *only neighborhoods with closed periods between 2017-2019 have been considered.*

ICAB PC: Antibiotic consumption index at Neighborhood level(ICAB): grams of antibiotics in active ingredient / tons harvested during the neighborhood periods.
ICAS: Antibiotic consumption index at Neighborhood level(ICAB): grams of antibiotics in active ingredient / tons harvested during the neighborhood periods/ productive months of the neighborhood

RESULTS

At neighborghood and region level *

Table 3.2: Antibiotics consumption at neighborhood level close periods for XI region (Aysen region) cont.

Neighborhood	Productive Period	ICAB PC	ICAS	Number of cycles
26A	Noviembre2017-Octubre2019	662,8	41,4	1
26B	Abril2017-Diciembre2018	721,4	40,1	4
28A	Abril2018-Diciembre2019	798,1	49,9	4
28B	Enero2018-Diciembre2019	227,3	16,2	9
28C	Septiembre2016-Mayo2018	600,3	35,3	1
29	Julio2017-Junio2019	98,9	6	2
30A	Julio2017-Marzo2019	87,3	6,1	5
30B	Febrero2017-Enero2019	462,0	30,4	5
31A	Mayo2016-Abril2018	702,6	46,8	2
31B	Septiembre2017-Agosto2019	132,5	8,2	4
33	Agosto2017-Julio2019	566,5	36,1	13
34	Marzo2016-Febrero2018	317,5	20,9	11

* *only neighborhoods with closed periods between 2017-2019 have been considered.*

ICAB PC: Antibiotic consumption index at Neighborhood level(ICAB): grams of antibiotics in active ingredient / tons harvested during the neighborhood periods.
ICAS: Antibiotic consumption index at Neighborhood level(ICAB): grams of antibiotics in active ingredient / tons harvested during the neighborhood periods/ productive months of the neighborhood

RESULTS

At neighborghood and region level *

Table 3.3 : Antibiotics consumption at neighborhood level close periods in XII region (Magallanes).

Neighborhood	Productive Period	ICAB PC	ICAS	Number of cycles
46	Julio2016-Octubre2018	87,1	4,7	3
47A	Febrero2016-Noviembre2018	158,4	7,5	2
48	Octubre2016-Julio2019	144,8	6,9	5
50A	Febrero2016-Septiembre2018	497	21,8	4
50B	Febrero2017-Octubre2019	10,5	0,5	7
52	Julio2016-Marzo2019	126,6	5,9	3
54A	Marzo2017-Marzo2019	No antibiotic		2
55	Junio2016-Diciembre2018	No antibiotic		2
56	Enero2017-Mayo2019	No antibiotic		5
58	Enero2016-Abril2018	No antibiotic		1

* *only neighborhoods with closed periods between 2017-2019 have been considered.*

ICAB PC: Antibiotic consumption index at Neighborhood level(ICAB): grams of antibiotics in active ingredient / tons harvested during the neighborhood periods.

ICAS: Antibiotic consumption index at Neighborhood level(ICAB): grams of antibiotics in active ingredient / tons harvested during the neighborhood periods/ productive months of the neighborhood

RESULTS

At neighborhood level

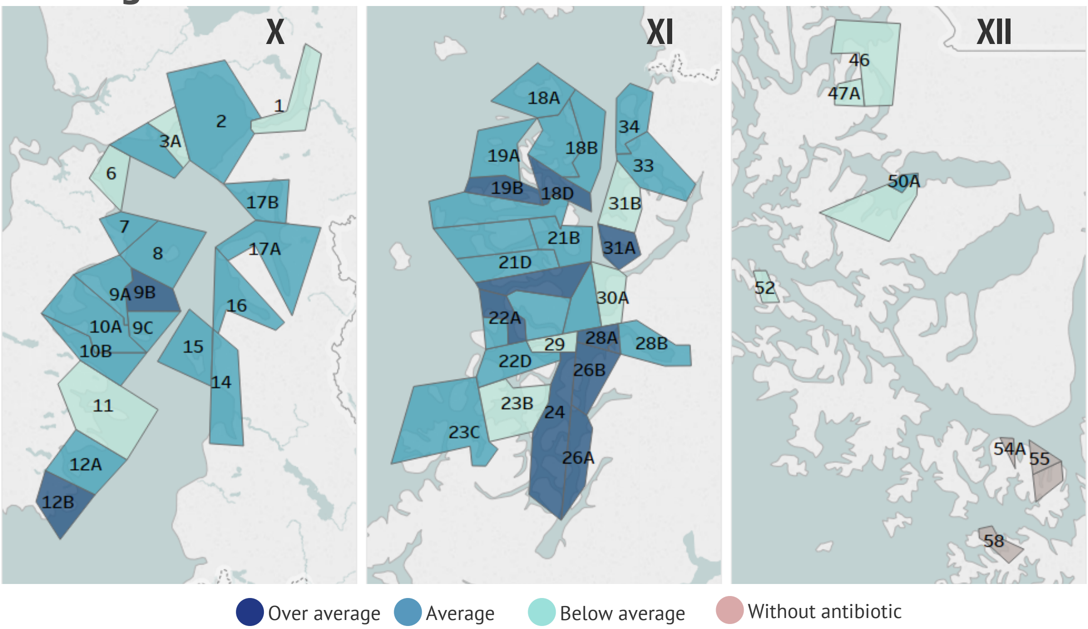


Fig 12.Antibiotic consumption at neighborhood level, close periods

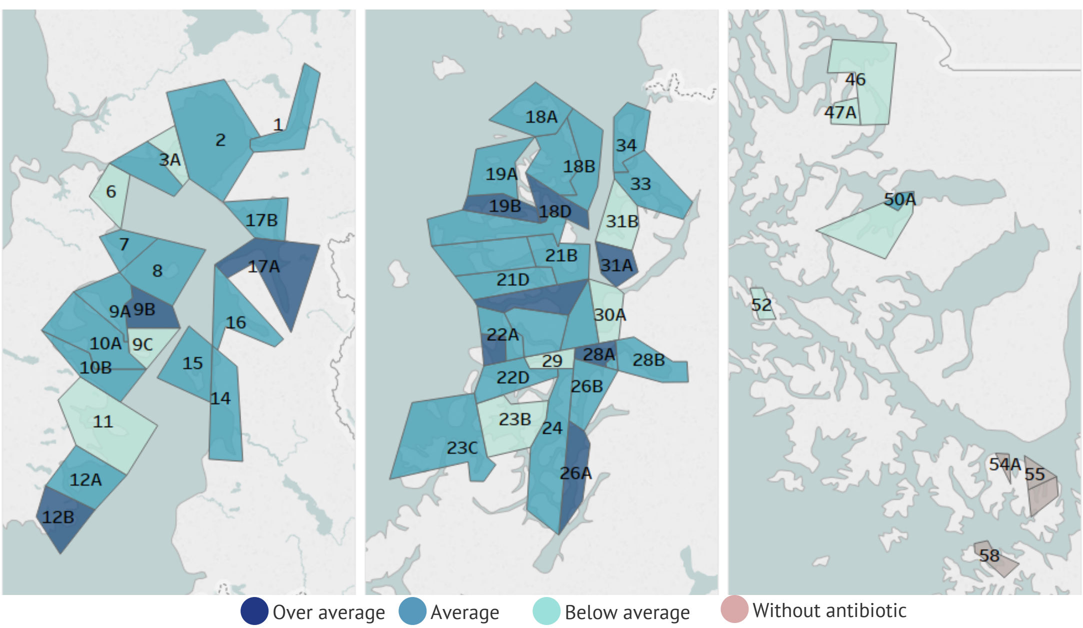


Fig 13.Antibiotic consumption at neighborhood level, Standard index

Comments

We have established the four base indicators (KPI) to describe the behavior of antibiotic consumption from analysis of data reported by participating companies in the CSARP.

The base indicators are used at different levels: Industry, region, neighborhood and species.

a) ICAF: The antibiotic consumption Index at closed cycle (CC): The amount principle active antibiotics (g) used at the end of the production cycle (after harvesting), divided by the harvested fish biomass (t) at farm level.

b) FC: Frequency of use (CC): It is the number of times that a farm received antibiotic treatment during the production cycle. A value higher than one indicates that all cages have received more than one treatment, whereas a value of 0.5 indicates that half of the cages were treated.

c) ICAB: The antibiotic consumption Index at the neighborhood level: It is the amount of antibiotics used in all farms producing on a neighborhood at the same time (same production period) divided by the harvested biomass in the neighborhood. The duration of the production period ranges between 21 to 24 months, and it follows 3-month fallowing prior to stocking new fish.

d) ICAS: Standard antibiotic consumption index: It is the antibiotic consumption during the productive period for the neighborhood (c) divided by the average number of operating months. This indicator incorporates the amount of time (time standardization). A higher rate means a more intensive use of antibiotics on a monthly basis.

CSARP collected data from 616 closed production cycles belonging to 17 companies in Los Lagos, Aysén and the Magellan regions.

The average consumption (ICAF) was 412 grams of active ingredient per ton harvested in 2017. This is the baseline(original) value set to achieve a 50% reduction which will correspond to no more than 206 g/t of antibiotic by 2025.

Data shows a reduction in the annual rate of time of antibiotic consumption (ICAF). The largest reduction of 29% was achieved in 2019. We also seen a reduction in the average frequency of antimicrobial treatments (CF) from 2.27 in 2017 to 1.97 in 2019. There is also an increasing trend in the number of farms (production cycles) withough antimicrobial treatments and the majority correspond to farms with Pacific Salmon or Atlantic salmon from the Magallean region.

There is a decrease in antimicrobial use in all three salmon species. Pacific salmon has the lowest antibiotic index (ICAF) in the 3 year period, with approximately 38 g/t; whereas the Atlantic salmon is the highest with average values of 375 g/t. So the amount of antibiotic used in Atlantic salmon is almost 10 times higher than in the Pacific salmon. This difference is explained both by a difference in pathogen susceptibility and the duration of the time at sea (16 months in Atlantic versus 10 months in the Pacific salmon).

Neighborhoods are geographically delimited management areas, where salmon production is synchronized between farms in the same neighborhood for a period ranging between 21 to 24 months. At the end of this production period, there is a mandatory 3 months fallowing period. In practice during the production period, only 1 cycle of atlantic salmon is produced per farm whereas 1 or 2 cycles can be allowed for farms wth rainbow trout or pacific salmon. In this report, data analysis is only for closed cycles. Future reports will include those farms currently in operation or operating in the future after completing harvesting and when meeting criteria established in this program.

The Magellanic region has the lowest consumption and the largest number of farms (production cycles) free of antibiotic. In los Lagos, neighborhoods 3A and 6 have the lowest (less than 100 g/t) ICAF and the highest ICAF (over 700 g/t) are for the neighborhoods 9B and 12B.

Aysen is the region with the highest antimicrobial use (ICAF) above the industry average of y g/t, particularly for those neighborhoods located at the most southern part (see fig 12). In Aysen, the neighborhood 28a is the one with the highest antimicrobial consumption (ICAF) and 18d with majority of treatments (ICAS). Neighboorhods in the Magellan region are free or have the lowest antimicrobial index at country level.

Photography: Pamela Alchao ©

CSARP Team

The Board of Directors is formed by the CEO of SalmonChile, the CEO of an aquaculture company and two members of the Monterey Bay Aquarium Seafood Watch program. The Board of Directors meets annually. In addition, a ten-person technical advisory committee (TAC) has been established in order to provide scientific advice and recommendations for reducing antibiotic use, and inform progress towards a Seafood Watch Good Alternative recommendation The TAC is comprised of veterinarians, business managers, independent scientists, the Chilean Salmon Marketing Council, and representatives of SFW and INTESAL,

Technical team: The technical team consists of an expert from the Salmon Technological Institute and from the Monterey Bay Aquarium Seafood Watch program.

Further information

About The Monterey Bay Aquarium Seafood Watch program

About Chilean Salmon marketing council

About INTESAL

Contact

csarp@intesal.cl

www.csarp.cl

APPEND

Directory member 2019

Arturo Clement, CEO SalmonChile

Sady Delgado, CEO AquaChile

Wendy Norden, Science director, Monterey Bay Aquarium Seafood Watch

Tyler Isaac, Senior Scientist, Monterey Bay Aquarium Seafood Watch

TAC members 2019

Name	Institution	Position
Wendy Norden	Monterey Bay Aquarium SFW	Director científico SFW, USA
Tyler Isaac	Monterey Bay Aquarium SFW	Científico Senior SFW, USA
Taylor Voorhees	Monterey Bay Aquarium SFW	Científico Senior SFW, USA
James Griffin	Chilean salmon marketing council	Directo Chilean salmon marketing council, USA
Cormac O´Sullivan	SGS Global	Aquaculture and fisheries certification, SGS. Irlanda.
Peter Bridson	Sea Green Consultance	Director
Fernando Mardones	Universidad Catolica de Chile	Profesor asistente Pontificia Universidad
Alejandro Heisinger	Multiexport Food	Subgerente de salud y bioseguridadn Multiexport de food.
Francisco Vallejos	Salmones Blumar	Subgerente de salud- Blumar, Chile
Jorge Mansilla	Mowi	Subgerente de salud-Mowi
Rolando Ibarra	INTESAL-SalmonChile	Jefe de Inocuidad- Coordinador.

Photographs courtesy of Pamela Alchao


CHILEAN SALMON
ANTIBIOTIC REDUCTION PROGRAM