

# Seafood Sustainability Approaches to RAS Ranking

An overview of the  
Seafood Watch Assessment Methodology for  
Recirculating Aquaculture



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SOLUTIONS ARE IN OUR NATURE

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## About Us

# SeaChoice: Healthy Choices, Healthy Oceans

SeaChoice, Canada's most comprehensive sustainable seafood program, is about solutions for healthy oceans. Launched in 2006, SeaChoice was created to help Canadian businesses and shoppers take an active role in supporting sustainable fisheries and aquaculture at all levels of the seafood supply chain. Based on scientific assessments, SeaChoice has created easy-to-use tools that help you make the best seafood choices.

Working in collaboration with the Monterey Bay Aquarium's acclaimed Seafood Watch program, SeaChoice undertakes science-based seafood assessments, provides informative resources for consumers, and supports businesses through collaborative partnerships.



*Credit: John Brouwer*

# CONSERVATION ALLIANCE FOR SEAFOOD SOLUTIONS



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Ecology  
Action  
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New England  
Aquarium



OCEAN OUTCOMES



FISHCHOICE.COM

## *The Common Vision*

1. Make a commitment to a corporate sustainable seafood policy.
2. Collect data on seafood products.
3. Buy environmentally responsible seafood.
4. Make product information publicly available.
5. Educate customers, suppliers, employees.
6. Support reform to improve fisheries and aquaculture management.



Growth in demand for sustainable seafood has driven demand for sustainability assessments.

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## Businesses scramble to keep up with green product demand

BusinessGreen Staff

Thursday, May 24, 2012 - 6:00am

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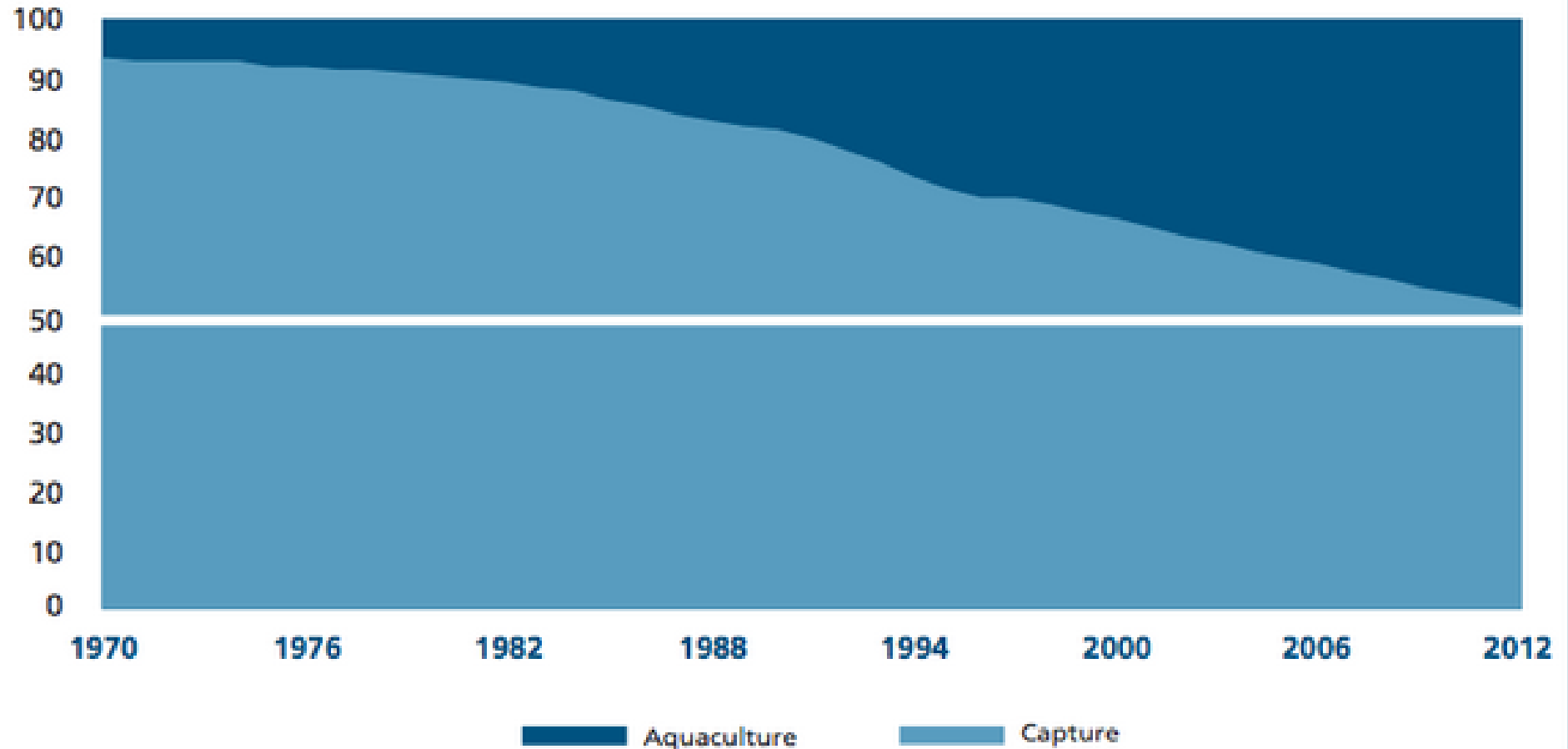
is://nonleads.a.doubleclick.net/ark?sa=1&ai=RP-ei53keVuPaK7WP3AGn27CA...




# Global growth in aquaculture production

Relative contribution of aquaculture and capture fisheries to food fish consumption

Percentage of fishery food supply (kg/capita)





Escalating environmental effects from aquaculture raise consumer concerns.



MONTEREY BAY  
AQUARIUM



Seafood  
WATCH

An illustration of a yellowtail fish, positioned below the 'Seafood WATCH' text.



# Consumer Guides for Seafood



# Monterey Bay Aquarium's Seafood WATCH® Program



## Seafood Watch® Criteria for Aquaculture

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# Guiding Principles:

- Support transparency and producers that make data on production practices/impacts available to stakeholders.
- Production that minimizes or avoids discharge of wastes at the farm level.
- Promote aquaculture at locations, scales and intensities that maintain function of ecologically valuable habitats.

# Guiding Principles

- Avoid use and discharge of chemicals toxic to aquatic life, and/or effectively controls environmental impact and risk to human health.
- Use quantitative and relative indicators to recognize global impacts of feed and efficiency of conversion of feed ingredients to farmed seafood.
- No substantial risk of deleterious effects to wild fish or shellfish populations.



# Guiding Principles

- No substantial risk of deleterious effects to wild populations through the amplification or transmission of pathogens or parasites.
- Use of eggs, larvae, or juvenile fish produced in hatcheries using domesticated brood stock.
- Recognize that energy use varies among production systems and can be a major impact for some operations.

## Seafood Watch® Criteria for Aquaculture

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- C1. Data
- C2. Effluent
- C3. Habitat
- C4. Chemical Use
- C5. Feed
- C6. Escapes and Introduced Species
- C7. Disease, Pathogen and Parasite Interaction
- C8. Source of Stock – Independence from wild fish stocks
- C9X. Predator and Wildlife Mortalities
- C10X. Escape of Unintentionally Introduced Species



## Seafood Watch® Criteria for Aquaculture

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### Score and Decision Rules

<b>GREEN</b>	'Best Choice'	6.6 – 10.0 ; no red, no critical
<b>YELLOW</b>	'Good Alternative/ Some Concerns'	3.3 – 6.6 ; or 1 red, no critical
<b>RED</b>	'Avoid'	0.0 – 3.3 ; 2 or more red, 1 or more critical

# Monterey Bay Aquarium Seafood Watch®

## Eco-certification Benchmarking Project

- Support for the concept of independent eco-certification programs to identify sustainable seafood options
- Recognizes aquaculture operations that have been certified by an eco-certification program whose standard, or standards, are consistent with at least a Seafood Watch Yellow “Good Alternative” rating
- Provides business partners with guidance as they navigate a marketplace of proliferating eco-certification programs
- Reduces redundancies in the broader sustainable seafood movement by not researching aquaculture operations that have already undergone an assessment against a robust standard



# Aquaculture Certifications

Needs to compliment, fit in to the Retailers SSP  
..... *as well as be credible:*



- Transparent
- Multi-stakeholder
- Third-party verified
- Science-based and independent
- Monitors and evaluates progress

# Aquaculture Certification - N. American Marketplace



Aquaculture  
Stewardship  
Council

Choose language: English



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The ASC's mission is to transform aquaculture towards environmental sustainability and social responsibility using efficient market mechanisms that create value across the chain.

Certifying fish farms



About the ASC



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# Aquaculture Certification in the North American Marketplace



Feeding the World Through  
Responsible **Aquaculture**

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## The Global Aquaculture Alliance

is an international, non-profit trade association dedicated to advancing environmentally and socially responsible aquaculture. GAA recognizes that aquaculture is the only sustainable means of increasing seafood supply to meet the food needs of the world's growing population.

Through the development of its Best Aquaculture Practices certification standards, GAA has become the leading standards-setting organization for aquaculture seafood.



LEARN MORE



# All Farmed Salmon Certification Standards Currently Benchmark to a Red Avoid Ranking

ASC
Friend of the Sea
Canadian Organic
Certified Quality Standard
GAA BAP
Naturland
Global GAP



# How are retailers going to meet their Sustainable Seafood Objectives?



In part, through the procurement of seafood produced using RAS

# RAS - Species Assessed To Date

- Coho Salmon (US)
- Arctic Char (Canada, US, Norway, Iceland)
- Atlantic Halibut (Canada- Scotian Halibut)
- Tilapia (Canada & US)
- Barramundi (US & Australia)
- Sea Bass & Sea Bream (Canada)
- White Sturgeon (BC)
- Yellow Perch (USA)
- Shrimp (US, Asia)

# Scope of the Assessments

Species	Farm	Location	Production System
Halibut	Scotian Halibut Ltd.	Nova Scotia, Canada	Closed-Containment, Full recirc.
Sea Bass/Sea Bream	Sustainable Blue	Nova Scotia, Canada	Closed-Containment, Full recirc.
Tilapia	MDM Aqua Farms	Alberta, Canada	Closed-Containment, Full recirc.
White Sturgeon	Target Marine Hatcheries	British Columbia, Canada	Closed-Containment, 90% recirc., 10% f-t
Yellow Perch	Bell Aquaculture	Indiana, USA	Closed-Containment, Full recirc.



# Sustainability Ranks/Recommendations

	Halibut	Sea Bass/ Sea Bream	Tilapia	White Sturgeon	Yellow Perch
C1 Data	8.61	9.17	6.39	8.89	8.61
C2 Effluent	10	10	10	10	10
C3 Habitat	8.27	8.79	6.0	8.51	7.27
C4 Chemical Use	10	10	6.0	10	10
C5 Feed	2.98	6.75	6.55	4.97	5.41
C6 Escapes	10	10	10	10	10
C7 Pathogens	8	10	8	8	8
C8 Stock	10	10	10	10	10
3.3X wildlife mortalities	0	0	0	0	0
6.2X Introduced species	0	0	0	0	0
Overall	8.73	9.34	7.87	8.80	8.66

# Driving Factors for Final Scores

## **The production system**

- Closed-containment addresses environmental issues commonly associated with aquaculture.
- This is the driving force behind high scores for the effluent, habitat, chemical use, escapes and pathogens criteria.

## **Producer Participation**

- Assessments are farm specific – data availability and quality was a direct result of cooperative producers.

## **Feed**

- In most cases, feed criterion is the lowest scoring.
- Score typically driven by high fishmeal/fish oil inclusion with unknown by-product inclusion and/or unknown sustainability (lack of data).



# Atlantic Salmon RAS report

## September 2014



February 8, 2013 - View to north west.  
Smolt quarantine tank and smolt quarantine biofilter. Fish will enter here in mid-March.



# Atlantic Salmon RAS Assessments

Criterion	Score (0-10)			Rank			Critical?
	Canada	Denmark	USA	Canada	Denmark	USA	
C1 Data	8.06			GREEN	GREEN	GREEN	n/a
C2 Effluent	9.00			GREEN	GREEN	GREEN	NO
C3 Habitat	6.63	9.22	7.50	YELLOW	GREEN	GREEN	NO
C4 Chemicals	6.00			YELLOW	YELLOW	YELLOW	NO
C5 Feed	4.55			YELLOW	YELLOW	YELLOW	NO
C6 Escapes	10.00	5.00	6.00	GREEN	YELLOW	YELLOW	NO
C7 Disease	10.00	8.00	8.00	GREEN	GREEN	GREEN	NO
C8 Source	10.00			GREEN	GREEN	GREEN	n/a
9X Wildlife mortalities	0.00			GREEN	GREEN	GREEN	NO
10x Introduced species escape	0.00	-2.00	-2.00	GREEN	GREEN	GREEN	n/a
<b>Total</b>	67.29	58.82	57.10				
<b>Final Score</b>	8.02	7.35	7.14				

OVERALL RANKING	
Final Score	7.14-8.02
Initial rank	GREEN
Red Criteria	0
Intermediate Rank	GREEN
Critical Criteria?	NO

FINAL RANK
<b>BEST CHOICE</b>



# Monterey Bay Aquarium Seafood Watch<sup>®</sup>

Global Assessment – All Species  
Recirculating Aquaculture Systems (RAS)  
December 2014



Image courtesy of AKVA Group

# Global RAS Assessment

Criterion	Score (0-10)	Rank	Critical?
C1 Data	7.00	GREEN	
C2 Effluent	9.00	GREEN	NO
C3 Habitat	6.83	GREEN	NO
C4 Chemicals	6.00	YELLOW	NO
C5 Feed	4.00	YELLOW	No
C6 Escapes	7.00	GREEN	NO
C7 Disease	8.00	GREEN	NO
C8 Source	10.00	GREEN	
C9X Wildlife mortalities	-2.00	GREEN	NO
C10X Introduced species escape	-2.00	GREEN	
<b>Total</b>	<b>53.83</b>		
<b>Final score</b>	<b>6.73</b>		

## OVERALL RANKING

Final Score	6.73
Initial rank	GREEN
Red criteria	0
Interim rank	GREEN
Critical Criteria?	NO

FINAL RANK
<b>GREEN</b>



# Assessment Criteria

## Criterion 1 Summary

Data Category	Relevance (Y/N)	Data Quality	Score (0-10)
Industry or production statistics	Yes	5	5
Effluent	Yes	7.5	7.5
Locations/habitats	Yes	10	10
Chemical use	Yes	5	5
Feed	Yes	5	5
Escapes, animal movements	Yes	10	10
Disease	Yes	5	5
Source of stock	Yes	10	10
Predators and wildlife	Yes	5	5
Other—(e.g., energy use)	Yes	7.5	7.5
<b>Total</b>			<b>70</b>

<b>C1 Data Final Score</b>	<b>7.00</b>	<b>GREEN</b>
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# Evidence or Risk of Chemical Use

## Criterion 4 Summary

C4 Chemical Use Final Score

6.00

YELLOW

In RAS chemicals are used...

- (1) to control, prevent, and treat diseases and parasites,
- (2) for fish management (e.g., reduce stress, grading, harvesting)
- (3) to clean and disinfect the system.

disinfectants (malachite green, hydrogen peroxide),  
parasiticides (benzoate, cypermethrim),  
anesthetics (isoeugenol, benzocaine),  
antibiotics (oxytetracycline).

**Disinfectants and anesthetics are considered to be of little risk to the environment - the main environmental concerns about chemical use in aquaculture focus on antibiotics and pesticides.**

# Decision Guidelines for Chemical Use

Concern	Chemical Use Examples	Score
No concern	<ul style="list-style-type: none"><li>▪ The production system is closed and does not discharge active chemicals or by-products (e.g., antibiotic resistant bacteria)</li><li>▪ The data score for chemical use is 0.75 or 1.0 and data show that chemical treatments have not been used over multiple production cycles</li><li>▪ The method of treatment does not allow active chemicals or by-products to be discharged</li></ul>	10
Low	<ul style="list-style-type: none"><li>▪ The data score for chemical use is 0.75 or 1.0 and data show that chemical treatments are used on average less than once per production cycle or once per year for longer production cycles</li><li>▪ The production system does not discharge water over multiple production cycles</li><li>▪ Evidence of no impacts on non-target organisms</li></ul>	8
Low-moderate	<ul style="list-style-type: none"><li>▪ Specific data may be limited, but the species or production systems have a demonstrably low need for chemical use</li><li>▪ A lack of evidence of impacts on non-target organisms</li><li>▪ No evidence of resistance to key treatments</li><li>▪ The production system has very infrequent or limited discharge of water (e.g., once per production cycle or &lt; 1% per day)</li></ul>	6

Moderate	<ul style="list-style-type: none"> <li>▪ Evidence of impacts on non-target species within an allowable zone of effect</li> <li>▪ Chemical use and/or impacts are unknown, the species or production system typically requires chemical use, and the treatment method allows the release of chemicals to the environment</li> <li>▪ Some evidence or concern of resistance to chemical treatments</li> <li>▪ No evidence of impacts on non-target species, but chemical use is known to be high and the production system allows active chemicals or by-products to be discharged<sup>14</sup></li> </ul>	4
Moderate-	<ul style="list-style-type: none"> <li>▪ Confirmed cases of resistance to chemical treatments</li> </ul>	2
high	<ul style="list-style-type: none"> <li>▪ Occasional, temporary or minor evidence of impacts to non-target organisms beyond an allowable zone of effect</li> <li>▪ Chemicals highly important to human health are being used<sup>15</sup> in significant or unknown quantities</li> </ul>	
High	<ul style="list-style-type: none"> <li>▪ Banned or illegal chemicals (as defined by the country of production AND the United States) have been used</li> <li>▪ Chemicals critically important to human health are being used<sup>16</sup> in significant or unknown quantities</li> <li>▪ Negative impacts of chemical use seen on non-target organisms beyond an allowable zone of effect</li> </ul>	0
Critical	<ul style="list-style-type: none"> <li>▪ Evidence of developed clinical resistance to chemicals (e.g. loss of efficacy of treatments) that are highly important or critically important to human health</li> </ul>	C

# Feed

## Criterion 5 Summary

C5 Feed Final Score

4.00

YELLOW

- Feed use and associated environmental impacts are highly species-specific. Some species require high levels of fishmeal and fish oil, while others are grown on feed containing no animal ingredients.
- Due to improvements in aquaculture feeds (particularly reductions in use of fishmeal and fish oil) and their efficiency of use (the feed conversion ratio, FCR), the majority of species assessed by Seafood Watch now have yellow or green scores for the feed criterion.

# Key Variables in Feed Assessment

- Fish in /Fish out Ratio (protein gain/loss)
- Wild Fish Use (vs domestic protein sources)
- Feed Footprint (ocean/land area)



Table 2. Feed scores for a variety of current Seafood Watch aquaculture assessments.

Species	Region	Production Method	Feed Score	Feed Ranking
Atlantic Salmon	Norway	Net Pens	5.2	YELLOW
Atlantic Salmon	Chile	Net Pens	4.2	YELLOW
Atlantic Salmon	Scotland	Net Pens	5.9	YELLOW
Atlantic Salmon	British Columbia	Net Pens	5.8	YELLOW
Branzino	Canada	RAS	6.75	GREEN
Halibut	Canada	RAS	2.98	RED
Perch	United States	RAS	5.41	YELLOW
Pompano	United States	RAS	5.09	YELLOW
Pompano	Asia/ Dominican Republic	Net Pens	2.38	RED
Red Drum	United States	Ponds	4.17	YELLOW
Red Swamp Crawfish	China	Ponds	9.75	GREEN
Red Swamp Crawfish	United States	Ponds	10.00	GREEN
Shrimp	United States	Ponds	3.35	YELLOW
Sturgeon	United States	RAS	3.59	YELLOW
Tilapia	United States	RAS	8.10	GREEN
Tilapia	China	Ponds	9.39	GREEN
Tilapia	Ecuador	Ponds	8.25	GREEN
Tilapia	Taiwan	Ponds	8.22	GREEN
Tilapia	Canada	RAS	6.55	YELLOW
Trout	US	Net Pens	5.22	YELLOW

# Feed Conversion Comparison

## RAS vs Other

Species	RAS	Other systems	Reference
Sea Bream	1.8–3.0	4-7	Ökte E. (2002)
Trout	0.8	1.1 (FTS)	Roque d'Orbcastel et al. (2009)
Trout / Sturgeon	0.43–0.80	0.73-0.84 (FTS)	Buric et al. (2010)
Salmon	1.05	1.27 (net-pen)	Fisheries and Ocean Canada (2010)
Salmon	0.8	1.2 (open flow system)	Aguila and Silva (2008)
Salmon	1.09	1.27 (net-pen)	Sintef & Conservation Fund (2013)

# Intentions of the Feed Assessment

This criterion intends to:

- Promote data transparency on feed use and ingredients
- Support the reduction of wild-caught fish used in feeds
- When wild-caught fish are used, support sourcing from sustainable fisheries
- Promote the use of non-edible (to humans) feed ingredients, and recognize the conversion of non-edible feed ingredients to edible aquaculture products
- Recognize the conversion of plant proteins to animal proteins through aquaculture
- Promote a net protein gain from aquaculture operations
- Promote post-harvest use of by-products from processed (e.g., filleted) aquaculture products

# What's needed in the marketplace



- Consistent quality/size
- Consistent supply
- Larger volumes
- Price acceptability



# Seafood WATCH® EAM: External Assessment Model

Enables third parties to utilize the Seafood Watch Criteria, Methodology, Research Process & Protocols, and approved trained contractors to assess aquaculture operations of interest that have not yet, or may not, be assessed by Seafood Watch

# More info.....

<http://www.montereybayaquarium.org/conservation-and-science/our-programs/seafood-watch>

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# Thanks

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