How have closed areas been accounted for within assessment methods in the literature?

Brian Langseth[1,*], Caren Barceló

[1]Northwest Fisheries Science Center, NOAA
2725 Montlake Blvd E., Seattle, WA. 98112
[*]brian.langseth@noaa.gov

Closed areas have been discussed during the last two assessment cycles

- During the 2021 data moderate reviews (Sup. SSC Report 1, Sept 2021)
- During the 2023 quillback rockfish rebuilding discussion (Sup. SSC Report 1, Mar 2024 - F.2.a)
- Topic of closed areas remains topic for ongoing discussion (Sup. SSC Report 1, Mar 2024 - J.3.a)

- This topic is also not new: Field et al. 2006 discuss influence on management and implications for various data types
  - Not how to model in assessments

Our approach

Question: How have closed areas been accounted for within assessments?

Approach: Mini-review

Scope: Primary literature

Mini reviews

1. Focus on question
2. Short in length
3. Supposedly fast

"Mini-reviews are direct, concise, and timely review articles that tackle emerging issues…."

Application: Provide a tangible baseline of what has been done before and elsewhere

Feature:
COMMUNICATING FISHERIES INFORMATION

A Call for Mini-Reviews: An Effective but Underutilized Method of Synthesizing Knowledge to Inform and Direct Fisheries Management, Policy, and Research

M.R. Donaldson
Ph.D. Candidate, Pacific Salmon Ecology and Conservation Laboratory, Centre for Applied Conservation Research and Department of Forest Sciences, University of British Columbia, Vancouver, British Columbia, Canada, V6T 1Z4

D. D. Aday
Associate Professor, Fisheries Ecology and Aquatic Sciences Laboratory, Department of Biology, North Carolina State University Raleigh, North Carolina 27695-7617, USA

S. J. Cooke
Associate Professor and Canada Research Chair, Fish Ecology and Conservation Physiology Laboratory, Ottawa–Carleton Institute of Biology, Carleton University, Ottawa, Ontario, Canada K1S 5B6

ABSTRACT: *Remaining current on emerging research in fisheries science is challenging. While review articles are often a go-to resource for managers and researchers alike, reviews in certain fisheries science subdisciplines are either dated or simply do not exist. Although there are a number of journals that publish lengthy reviews on topics relevant to fisheries, these are not always accessible and may not be read by managers, policymakers, and legislators. To address these concerns, there is a need for direct, concise, and timely review articles that tackle emerging issues (i.e., mini-reviews). Reviews of this type are rarely published in American Fisheries Society journals or fisheries journals in general, despite the fact that they have been widely successful and influential (in terms of both academic measures of research "impact" and in affecting change in management and policy) in ecological and conservation journals. We provide suggestions for developing high-quality mini-reviews and propose that Fisheries is an ideal outlet for these short and timely articles aimed at reaching a broad, multidisciplinary audience, including scientists, managers, policymakers, legislators, and other stakeholders.*

Mini-artículos de revisión: un método efectivo pero subutilizado para sintetizar el conocimiento e informar y dirigir el manejo, la política y la investigación en pesquerías

RESUMEN: la vigencia del conocimiento de la nueva investigación en pesquerías representa un desafío. A pesar de que los artículos de revisión son una fuente obligada tanto para los manejadores como para los investigadores, en ciertas sub-disciplinas de la ciencia pesquera las revisiones son obsoletas o simplemente no existen. Si bien hay varias revistas que publican extensas revisiones en tópicos relevantes para las pesquerías, éstos no siempre son accesibles y pueden pasar desapercibidos por los manejadores, políticos y legisladores. Para atender estos problemas, existe la necesidad de producir artículos de revisión directos, concisos y oportunos que aborden temas emergentes (i.e. mini-artículos de revisión). Las revisiones de este tipo son rara vez publicadas por las revistas de la Sociedad Americana de Pesquerías pese a que han sido muy exitosas y trascendentes (en términos tanto de medida académica del impacto de la investigación como en la afectación en cuanto a cambios en el manejo y la política pesquera) en las revistas de ecología y conservación. Se hacen sugerencias para desarrollar mini-artículos de revisión de alta calidad y se propone la revista Fisheries como un sustrato ideal para este tipo de artículos cortos y oportunos, dirigidos a audiencias amplias y multidisciplinarias que incluyen científicos, manejadores, políticos, legisladores y otros interesados.

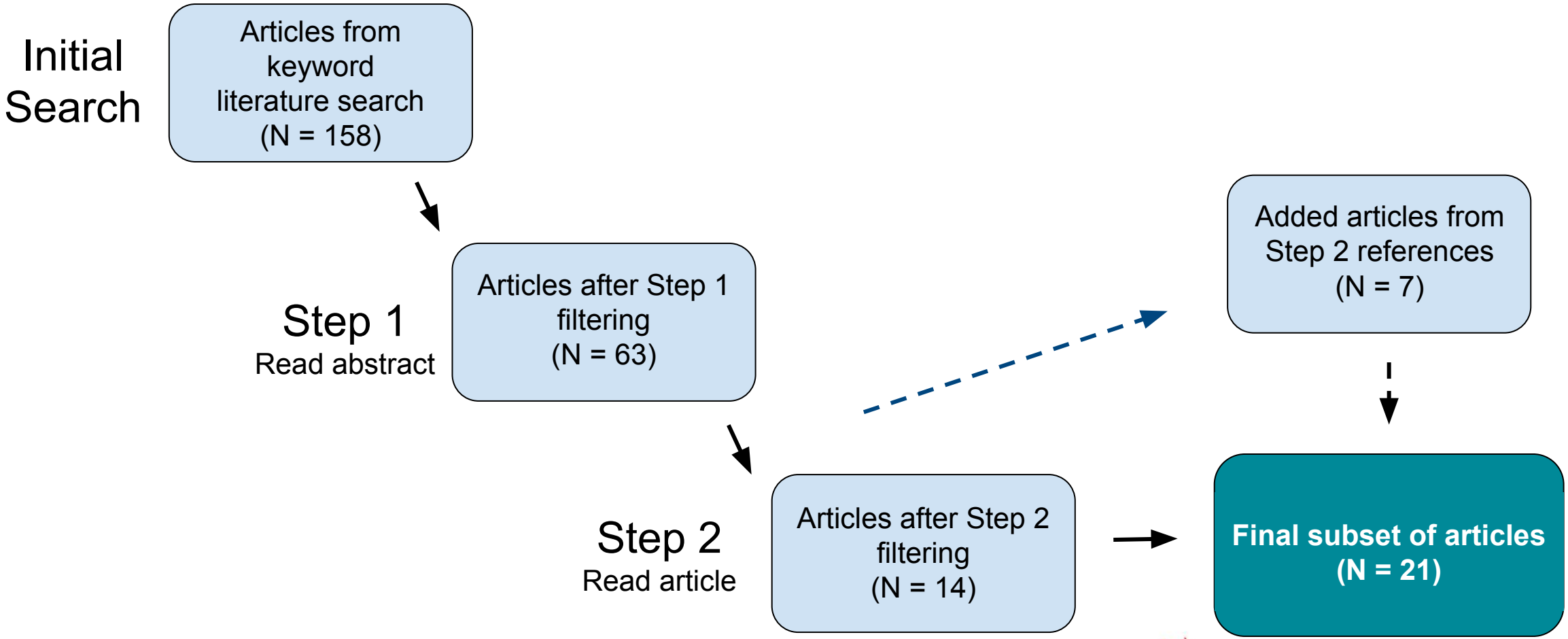
Introduction

The knowledge base in fisheries science and management is expanding rapidly, continually becoming more integrative and multidisciplinary (Stephenson and Lane 1995). While the generation of vast quantities of information for scientific literature is exciting, it also presents a challenge to fisheries scientists and managers wishing to stay abreast of the latest developments in their fields. Journal proliferation, globalization of scientific information exchange, and increased accessibility of grey literature result in a continually expanding literature base. We propose that mini-reviews, which we define as short, tightly focused, synthetic articles, could be a primary means of conveying information associated with new or developing fields that would reach a broad readership of managers and researchers through a general, widely read, and accessible journal such as *Fisheries*. Herein, we provide some concepts to consider when writing mini-reviews, and we make a call for considering *Fisheries* as a primary outlet for such papers.

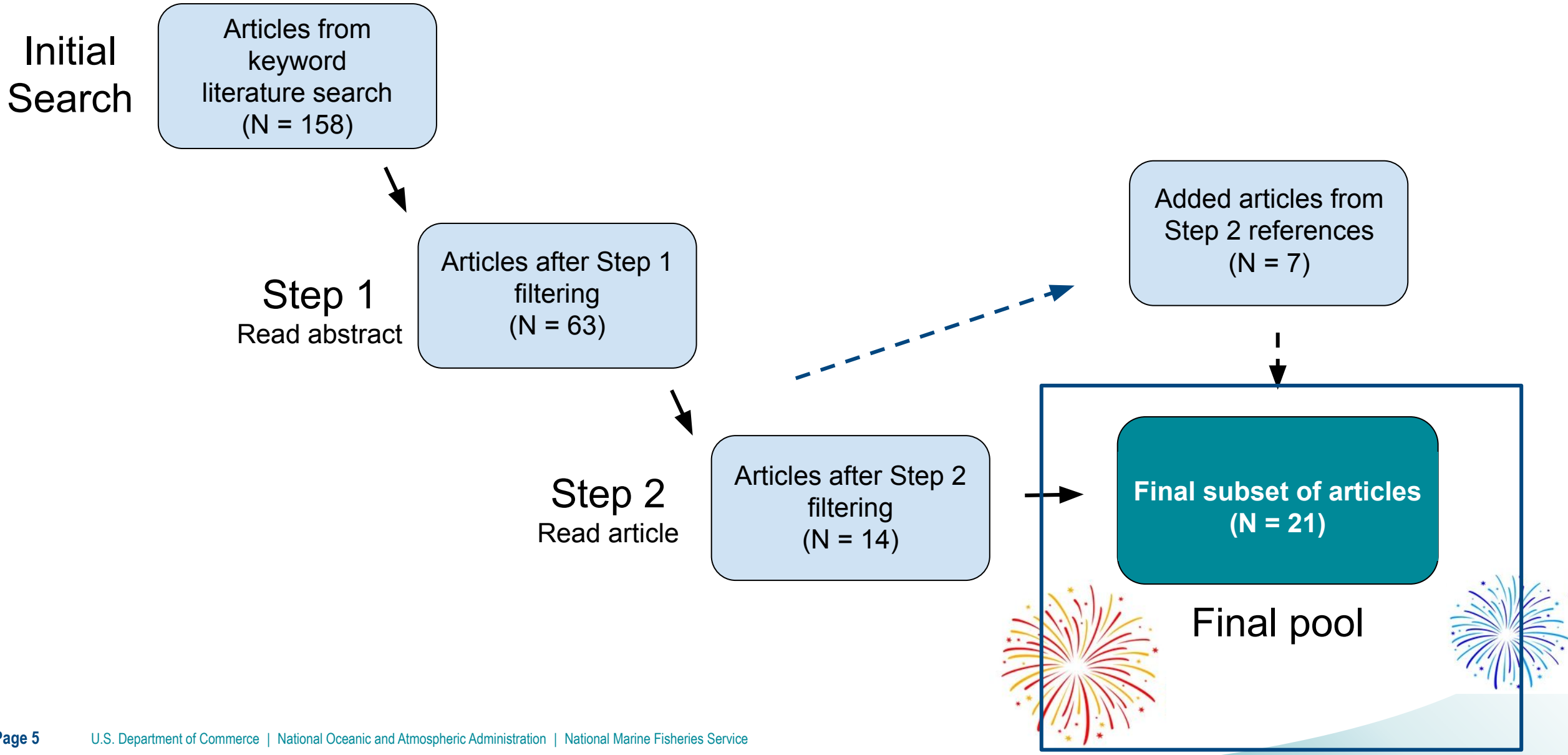
What is a Mini-Review and Why Write One?

The primary purpose of traditional literature reviews is to synthesize and simplify expansive fields of study. Their function is to provide readers with a synthesis of current information,

Article selection



Article selection



Results: Accounting for closed areas in assessment methods

Final subset of articles (N = 21)

Two categories with three broad approaches

More than just statistical catch at age models!

Results: Accounting for closed areas in assessment methods

Final subset of articles (N = 21)

More than just statistical catch at age models!

Two categories with three broad approaches

1. Model-based category (11 articles)
   a. Aggregate: Model closed and open areas together (7 articles)
   b. Separate: Model closed and open areas as separate models (5 articles)
   c. Spatial: Model closed and open areas within spatial model (7 articles)

Results: Accounting for closed areas in assessment methods

Final subset of articles (N = 21)

More than just statistical catch at age models!

Two categories with three broad approaches

1. Model-based category (11 articles)
   a. Aggregate: Model closed and open areas together (7 articles)
   b. Separate: Model closed and open areas as separate models (5 articles)
   c. Spatial: Model closed and open areas within spatial model (7 articles)

2. Data-based category (10 articles)
   a. Sampling in closed areas to approximate model parameters (4 articles)
   b. Sampling in closed areas to approximate status (3 articles)
   c. Sampling in closed areas as empirical harvest control rule (3 articles)

Results: Accounting for closed areas in assessment methods

Final subset of articles (N = 21)

More than just statistical catch at age models!

Two categories with three broad approaches

1. Model-based category (11 articles) **Many compared across approaches**
   a. Aggregate: Model closed and open areas together (7 articles)
   b. Separate: Model closed and open areas as separate models (5 articles)
   c. Spatial: Model closed and open areas within spatial model (7 articles)

2. Data-based category (10 articles)
   a. Sampling in closed areas to approximate model parameters (4 articles)
   b. Sampling in closed areas to approximate status (3 articles)
   c. Sampling in closed areas as empirical harvest control rule (3 articles)

Approach 1: Model together

Aggregate together with differing levels of combining data

- Weight by areas, fleets

Apply alternative ways to account for closed areas

- Allow dome shaped selectivity in years with closed areas
- Maintain fleet structure that matches open/closed areas (fleets-as-areas)

Table 1: Ways in which closed areas are accounted for within assessment methods in the primary literature

Category	Groupings	Approach	Location	Application species	Source
Model-based	Spatially Aggregated	Combine open and closed areas in single model	Australia	Pink ling	Punt et al. 2016; 2017
			U.S. West Coast	Rockfish species	McGilliard et al. 2015
			U.S. West Coast	Rockfish species	Punt and Methot 2004
			Unspecified	Unspecified	Garrison et al. 2011
			Unspecified	Unspecified	Pincin and Wilberg 2012
		Dome-shaped selectivity in years with closed areas	Georges Bank	Scallops	Hart et al. 2013
			U.S. West Coast	Rockfish species	McGilliard et al. 2015
		Fleets-as-areas	Australia	Pink ling	Punt et al. 2016; 2017

Approach 2: Model separately

- Two (or more) separate models

Table 1: Ways in which closed areas are accounted for within assessment methods in the primary literature

Category	Groupings	Approach	Location	Application species	Source
	Spatially Separate	Open and closed areas modeled separately	U.S. West Coast	Rockfish species	McGilliard et al. 2015
			Georges Bank	Scallops	Hart et al. 2013
			Georges Bank	Scallops	Hart and Chang 2022
			Unspecified	Unspecified	Garrison et al. 2011
			Chesapeake Bay	Eastern oyster	Damiano and Wilberg 2019

Approach 3: Model within spatial model

- Varying degrees of connectivity among areas within spatial model

Table 1: Ways in which closed areas are accounted for within assessment methods in the primary literature

Category	Groupings	Approach	Location	Application species	Source
	Spatially Explicit	Open and closed areas as sub-regions, no movement	Australia	Pink ling	Punt et al. 2016
			Australia	Coral trout	Little et al. 2017
			U.S. West Coast	Rockfish species	Punt and Methot 2004
		Open and closed areas as sub-regions, with movement	U.S. West Coast	Rockfish species	McGilliard et al. 2015
			Unspecified	Unspecified	Garrison et al. 2011
			Unspecified	Unspecified	Pincin and Wilberg 2012
			Australia	Rock lobster	Hobday et al. 2005

Approach 4: Sampling to inform parameters

- Mostly for estimating measures of fishing intensity

Table 1: Ways in which closed areas are accounted for within assessment methods in the primary literature

Category	Groupings	Approach	Location	Application species	Source
Data-based	Parameter Estimation	Stockwide F (via tagging)	Belize	Rock lobster	Harford et al. 2015
		Exploitation rate	New Zealand	Snapper	Willis and Millar 2005
		Stockwide SPR	U.S. West Coast	Grass rockfish	Wilson et al. 2014
		Estimate M in closed areas to estimate F in open areas	Mediterranean	Seabream and Grouper	Belharet et al. 2020

Approach 5: Sampling to approximate status

- Closed areas used as measure of unfished conditions
  - Only applied to invertebrates

Table 1: Ways in which closed areas are accounted for within assessment methods in the primary literature

Category	Groupings	Approach	Location	Application species	Source
	Approximate Status	Linear model coefficient ratio	New Zealand	Rock lobster	Hanns et al. 2022
		SPR from SSB in survey	Belize	Queen conch	Acosta 2006
		Density ratios and SPR	Mediterranean	Spiny lobster	Diaz et al. 2016

Approach 6: Sampling in closed areas to directly inform management action

- Controls on catch or effort

Table 1: Ways in which closed areas are accounted for within assessment methods in the primary literature

Category	Groupings	Approach	Location	Application species	Source
	Harvest	CPUE	U.S. West Coast	Grass rockfish	Wilson et al. 2010
	Control Rule	Density ratio	U.S. West Coast	Various rockfish	Babcock and MacCall 2011
			Unspecified	Unspecified	McGilliard et al. 2011

Comparisons among model-based approaches

- Many articles compared across more than one model-based approach
  - No comparisons for data-based approaches
- Modeling closed areas separately (Hart et al. 2013) or within spatial model (Punt and Methot 2004) performed better than ignoring
- Aggregate **<** Dome-shaped or excluding fishery CPUE **<** Separate **<** Spatial (McGilliard et al. 2015)
- Spatially explicit performed best (Punt et al. 2016) though management objectives could still be obtained even when closed areas not accounted for (Punt et al. 2017)

Common themes

- Approaches vary from model-based to data-based and from data-rich to data-poor
  - SCAA to surplus production to parameter estimation to empirical density estimates
- Specifically accounting for closed areas is better than aggregating
- Having data available in closed areas is important
  - Model-based approaches included survey data in closed areas
  - Required for data-based approaches
- Movement of the population affects results
  - Greater differences between open and closed makes accounting for closed areas more important
- Time since closed areas implemented and relative size of closed areas matter
  - Approaches differ more after 20 years
  - Larger areas increase difference between approaches

Areas for future advancement

- Research: Comparisons among model-based and data-based assessments and explore across fishery data availability

- Practical: Areas we see to enhance data collection for PFMC assessments
  - Proportion of areas closed
  - Trends and population structure in closed areas along with nearby open areas
  - Full collection in open areas

- Our review: Add approaches from formal assessments used for management

Things for GFSC consideration to trigger discussion

- Comment on suitability of approaches for U.S. West Coast groundfish assessments
  - Value of empirical approaches?

- How best to summarize for best practices document?

- Comments for next steps
  - Any other missing elements needed to inform overall topic
  - Next steps for data collection
  - Value of reviewing formal assessments and adding their approaches to our review

Thank you

Questions?

Our approach

Question: How have closed areas been accounted for within assessments?

Approach: Mini-review

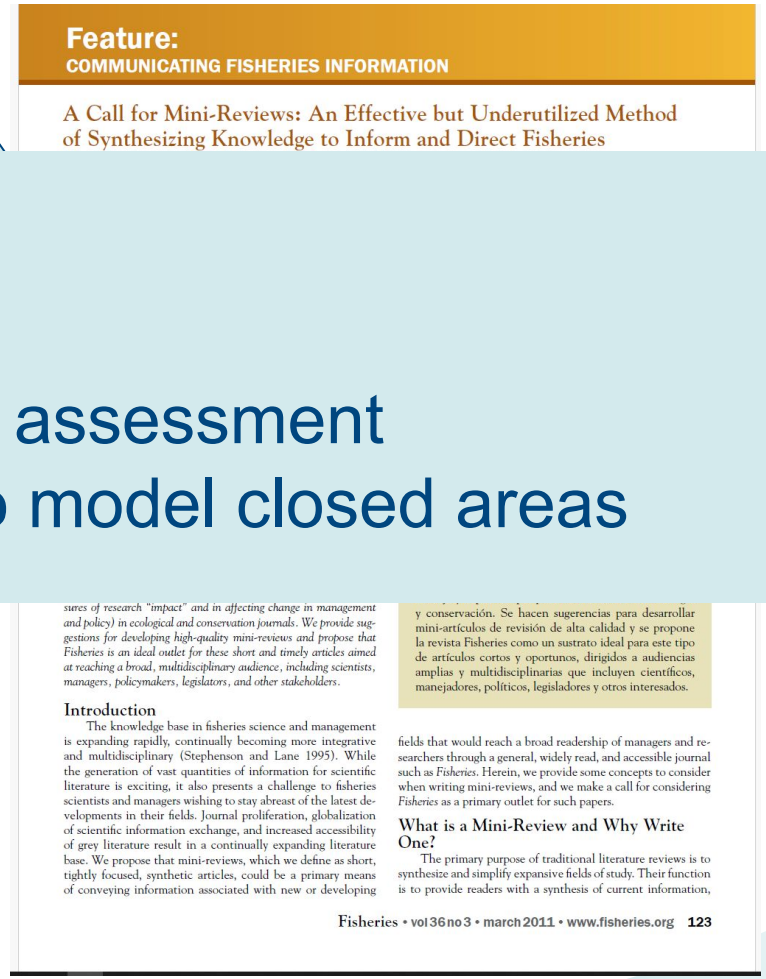
"Mini-reviews are

This paper DOES NOT

- Say how closed areas will be modeled for any assessment
- Offer a silver bullet of the best and only way to model closed areas

3. Supposedly fast

Application: Provide a tangible baseline of what has been done before and elsewhere



Feature:
COMMUNICATING FISHERIES INFORMATION

A Call for Mini-Reviews: An Effective but Underutilized Method of Synthesizing Knowledge to Inform and Direct Fisheries

sures of research "impact" and in affecting change in management and policy) in ecological and conservation journals. We provide suggestions for developing high-quality mini-reviews and propose that Fisheries is an ideal outlet for these short and timely articles aimed at reaching a broad, multidisciplinary audience, including scientists, managers, policymakers, legislators, and other stakeholders.

y conservación. Se hacen sugerencias para desarrollar mini-artículos de revisión de alta calidad y se propone la revista Fisheries como un sustrato ideal para este tipo de artículos cortos y oportunos, dirigidos a audiencias amplias y multidisciplinarias que incluyen científicos, manejadores, políticos, legisladores y otros interesados.

Introduction

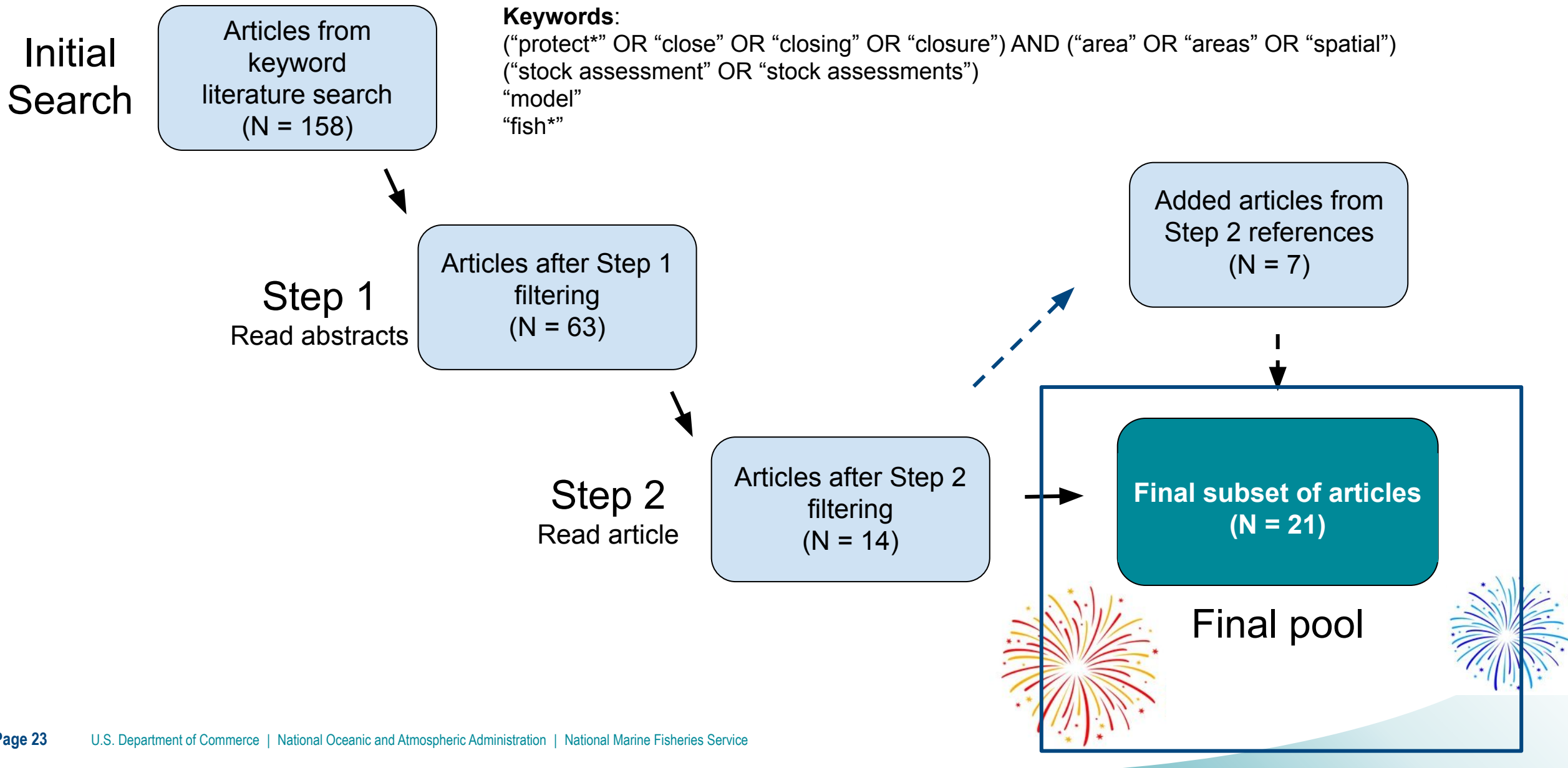
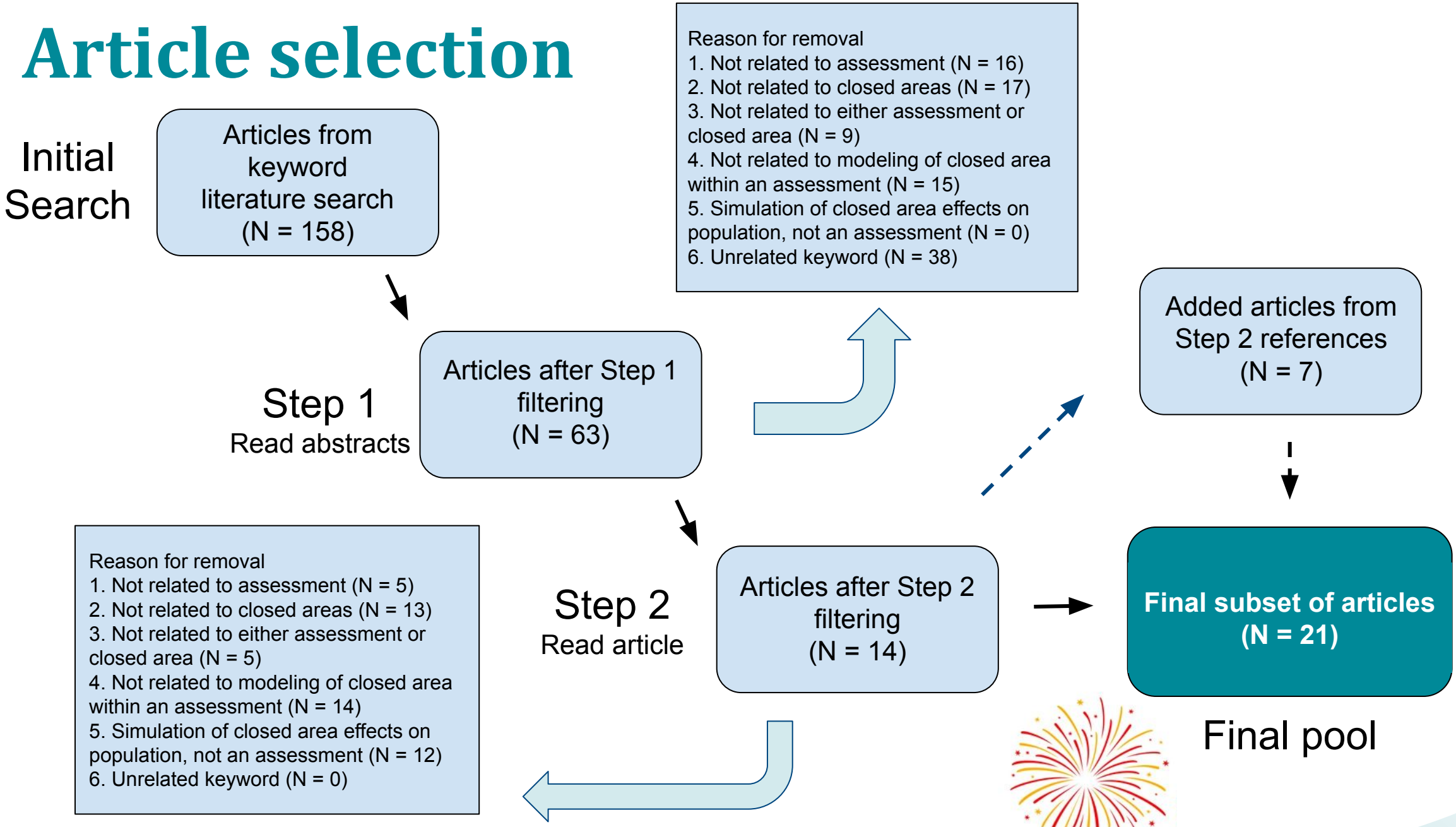
The knowledge base in fisheries science and management is expanding rapidly, continually becoming more integrative and multidisciplinary (Stephenson and Lane 1995). While the generation of vast quantities of information for scientific literature is exciting, it also presents a challenge to fisheries scientists and managers wishing to stay abreast of the latest developments in their fields. Journal proliferation, globalization of scientific information exchange, and increased accessibility of grey literature result in a continually expanding literature base. We propose that mini-reviews, which we define as short, tightly focused, synthetic articles, could be a primary means of conveying information associated with new or developing fields that would reach a broad readership of managers and researchers through a general, widely read, and accessible journal such as *Fisheries*. Herein, we provide some concepts to consider when writing mini-reviews, and we make a call for considering *Fisheries* as a primary outlet for such papers.

What is a Mini-Review and Why Write One?

The primary purpose of traditional literature reviews is to synthesize and simplify expansive fields of study. Their function is to provide readers with a synthesis of current information,

Fisheries • vol 36 no 3 • march 2011 • www.fisheries.org 123

Article selection



Article selection