

CITES

Proposed revision of Resolution Conf. 9.24 (CoP12 Com. I. 3)

Criteria for listing on Appendix I and Appendix II

Test of the applicability of the criteria

This document has been prepared to facilitate the assessment of the proposed revision of Resolution Conf. 9.24 (CoP12 Com. I. 3) using an individual plant or animal taxon.

Notice to reviewers: This review should focus on whether the criteria in Table 1, Table 2 and the accompanying definitions, explanations, and guidelines in Annex 5, are biologically sound and applicable for the taxon under review. The purpose of this review is not to determine whether the current listing status of the taxon under review is appropriate.

Registration Form and Contact Details

Please fill in the details below and send the completed document, as appropriate, to the Chairman of the Animals Committee or the Chairman of the Plants Committee.

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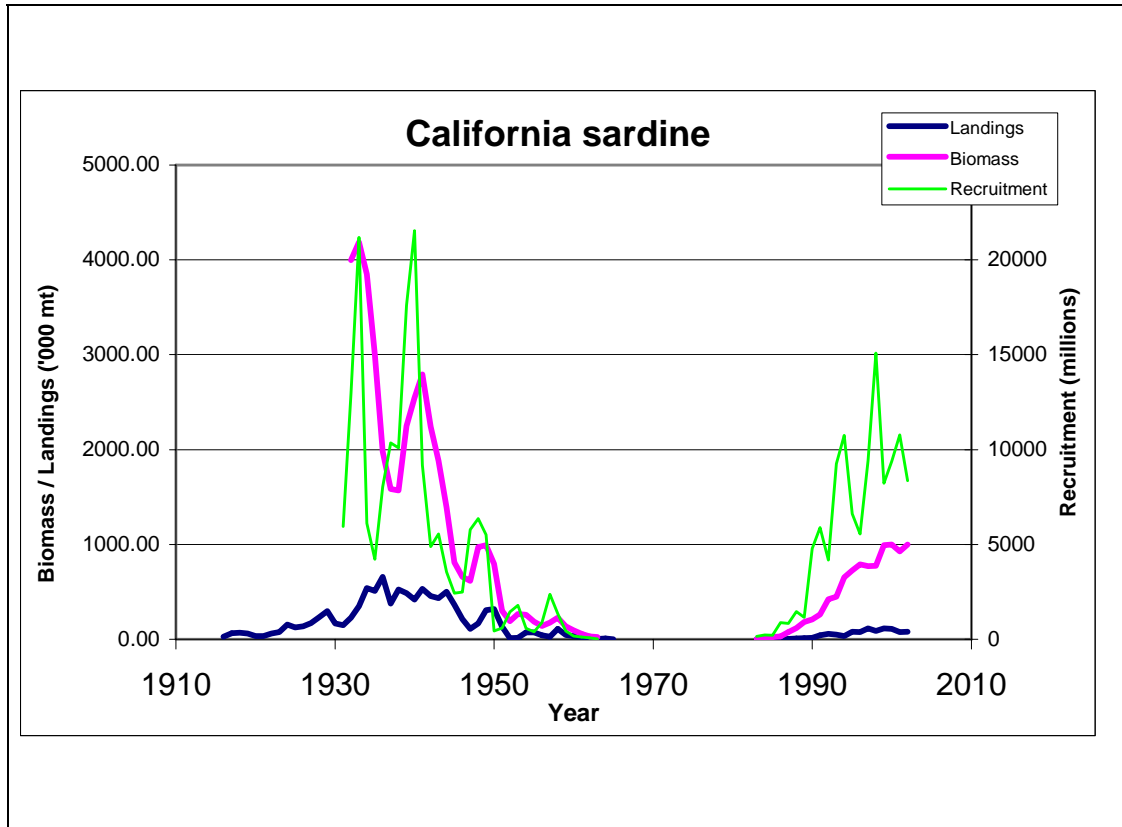
Taxon reviewed (including common and taxonomic names):

California sardine (*Sardinops sagax*)

General notes about this species review:

The data reported here are for “California sardine”, a stock which at various times has extended from Baja California, Mexico to British Columbia, Canada. There are also 3-4 other smaller stocks or sub-stocks in the southern parts of the range which are not included in this analysis. The California sardine population was heavily fished during the 1930s to 1950s and had essentially “crashed” by about 1964. From then until 1983, the median population size was about 5,000 mt (down from a high of 4.2 million mt). Beginning in the mid-1980s, the stock began to recover at rates averaging about 35% per year, and is now at least 1 million mt in size. This review is intended to evaluate what would / could have happened if the current CITES criteria and guidelines had been applied to the population as it was during the years 1964-83. Similar evaluations for the most recent year (2002) are also included for comparison. The following graphic depicts the trends in spawning biomass from 1932 to 2002.

OVERALL CONCLUSION: California sardine would have deservedly qualified for listing on Appendix 1 during the years 1964-83 based on both biological and trade criteria, but does not qualify now.



Please return your completed paper or electronic document to one of the below:

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Instructions on conducting the criteria review

- Tables 1 and 2 outline the proposed draft criteria for listing species on Appendix I and Appendix II of CITES, respectively. These should be read in conjunction with the definitions, explanations, and guidelines included in the proposed amendment of Annex 5.
- Please test the criteria for Appendix I and II using the information you have for the taxon selected i.e. fill out Table 1 and Table 2. This allows a more complete test of the criteria in the short time allowed to us.
- If you fill in this form electronically then these definitions and explanations can be accessed by clicking on the Hyperlink within the table (or 'Ctrl' and click). To get back to the text after clicking a Hyperlink you click on the 'Back' arrow in the Web toolbar (if this is not set up in your version of Word then go to 'View' in the Word menu, then 'Toolbars' and click on 'Web').
- We have provided a copy of the definitions and explanations (Annex 5) at the end of this document for those who wish to fill in the tables as a hard copy.
- Using the data available to you for your chosen taxon please indicate the key data that you used to make your decision, and any problems you had in interpreting or applying the criteria for your chosen taxon.
- Once completed, please send electronic copies and/or hard copies of the review, as appropriate, to the Chair of the Plants Committee or Animals Committee.
- Thank you for taking part in this process.

The Completed forms must be returned by 31 October 2003

Table 1 – Comments from reviewer on applicability of criteria for listing on Appendix I

<p style="text-align: center;">CRITERON</p> <p>For your information for a species to fulfill the draft criteria for Appendix I it must meet the trade criteria and at least one of the criteria A-D.</p>	<p style="text-align: center;">NOTES</p> <p>Whenever appropriate, indicate ways in which this criterion and definitions, explanations and guidelines could be improved and/or quantified to better suit this taxon and its relatives (If you need additional space, please use a separate sheet of paper).</p> <p>For the following specific questions, if a point estimate is not available, please provide a likely range of values (e.g., “about 6,000 – 10,000 individuals”) or some kind of rough estimate or inference (e.g., “likely to be less than 500 square kilometres”). Please try to make a numerical guess or give a verbal description and only use DNW (Do Not Know) if there is truly no information available on the quantity in question.</p>
<p>Trade Criterion Is or may the <u>species</u> be <u>affected by trade</u>?</p>	<p>YES, the species was and is heavily traded internationally. The adjective “international” should be added before “trade”.</p>
<p>A) The <u>wild population is small</u>, and is characterized by at least one of the following (see definitions below):</p>	<p>What was/is the estimated size of the <u>population</u>? Please include units of measurement.</p> <p>This criterion may have been satisfied during the 1964-83 period: Most people would not consider a number like 25 million individuals “small” but, at this size, sardines exhibited many of the characteristics of small, non-viable populations (see below). This criterion would not be satisfied for 2002.</p>

	<table border="0" style="width: 100%;"> <tr> <td style="text-align: center;">Spawning biomass</td> <td style="text-align: center;">Spawning numbers (approx)</td> </tr> <tr> <td>Maximum 1933: 4.2 million mt</td> <td>21 billion</td> </tr> <tr> <td>Minimum 1964-83: median about 5,000 mt (approx. range 2,500-10,000 mt)</td> <td>25 million (12.5- 50 million)</td> </tr> <tr> <td>Current 2002: 1 million mt</td> <td>5 billion</td> </tr> </table> <p>Comments: The Annex 5 numeric guideline for a small wild population of 5,000 individuals is not at all useful for California sardine, nor for other commercially-exploited fish stocks, nor perhaps for any taxa other than some large terrestrial vertebrates or some marine mammals. Sardine recruitment and population size is so variable that population sizes in the millions may be required for a population to be viable. In fact, the 12.5-25 million fish in the population during the lowest points of the 1964-83 period were insufficient to maintain normal schooling behaviour. Instead, sardines mixed with schools consisting of mackerel of the same size. However, this made them even more vulnerable to extirpation because, even though directed fishing on sardines had ceased, they were caught as bycatch in the mackerel fishery. The Annex 5 numeric guidelines for “small wild population” should take this example into account, but it is likely that sardines would fall outside of (above) any range that might be suggested as a guideline applying across taxa.</p>	Spawning biomass	Spawning numbers (approx)	Maximum 1933: 4.2 million mt	21 billion	Minimum 1964-83: median about 5,000 mt (approx. range 2,500-10,000 mt)	25 million (12.5- 50 million)	Current 2002: 1 million mt	5 billion
Spawning biomass	Spawning numbers (approx)								
Maximum 1933: 4.2 million mt	21 billion								
Minimum 1964-83: median about 5,000 mt (approx. range 2,500-10,000 mt)	25 million (12.5- 50 million)								
Current 2002: 1 million mt	5 billion								
<p>A)(i) an observed, inferred or projected <u>decline</u> in the number of individuals or the area and quality of habitat; or</p>	<p>Yes, this criterion would be satisfied for 1964-83 No, it would not be satisfied for 2002.</p> <p style="text-align: center;">Historical extent of decline</p> <p>(A) Baseline = Maximum spawning biomass which occurred in 1933 (4.2 million mt); this is unlikely to be anomalously high, because it is believed that stock size was even higher in earlier years.</p> <p>Minimum 1964-83: declined to 0.12% of the baseline Current 2002: declined to 23.8% of the baseline</p> <p>(B) Baseline = Maximum area of distribution (spawning area), which probably occurred in 1933 (approx. 400,000 km²)</p> <p>Minimum 1964-83: declined to 0.1% of the baseline Current 2002: declined to 52.5% of the baseline</p> <p style="text-align: center;">Recent rate of decline</p>								

	<p>Spawning biomass declined by 98.1% from 1954 to 1964 Spawning biomass declined by 99.6% from 1944 to 1964</p> <p>Spawning biomass increased 84.4 times from 1992 to 2002 Spawning biomass increased 200 times from 1982 to 2002</p>
<p>A)(ii) each <u>sub-population being very small</u>; or</p>	<p>What were/are the estimated sizes of the <u>subpopulation(s)</u>? Please include units of measurement.</p>
	<p>The data reported here are for “California sardine”, a stock which at various times has extended from Baja California, Mexico to British Columbia, Canada. There are also 3-4 other smaller stocks or sub-stocks in the southern parts of the range which are not included in this analysis.</p>
<p>A)(iii) a majority of individuals, during one or more life-history phases, being concentrated in one <u>sub-population</u>; or</p>	
<p>A)(iv) large short-term <u>fluctuations</u> in the number of individuals appropriate to measuring population size for the species concerned;</p>	<p>If the population was/is characterized by large short-term <u>fluctuations</u> in the numbers of individuals, what was/is the average magnitude in orders of magnitude? What was/is the average period of fluctuation in years?</p>
<p>A)(v) a high <u>vulnerability</u> due to the species' biology or behaviour (including migration).</p>	<p>Yes, this criterion would have been satisfied for 1964-83. Sardines are a schooling species, but the schooling mechanism broke down at the lowest observed stock sizes.</p> <p>It would be useful if Annex 5 provided more guidance on how to apply the vulnerability factors.</p>

<p>B) The wild population has a restricted <u>area of distribution</u> and is characterized by at least one of the following (see definitions below):</p>	<p>What was/is the estimated <u>area of distribution</u>? If listing on the basis of one or more <u>sub-populations</u>, what were/are the estimated areas of distribution of the subpopulation(s)? Please include units of measurement?</p> <p>This criterion would have been satisfied for 1964-83 It would not have been satisfied for 2002</p> <p>Very approximate areas of distribution (spawning area only) Maximum 1933: 400,000 km² Minimum 1964-83: 140-600 km² Current 2002: 210,000 km²</p>
<p>B)(i) <u>fragmentation</u> or occurrence at very few locations; or</p>	
<p>B)(ii) large fluctuations in the <u>area of distribution</u> or the number of <u>sub-populations</u>; or</p>	
<p>B)(iii) a high <u>vulnerability</u> due to the species' biology or behaviour (including migration); or</p>	<p>Yes, this criterion would have been satisfied for 1964-83. Sardines are a schooling species, but the schooling mechanism broke down at the lowest observed stock sizes.</p> <p>It would be useful if Annex 5 provided more guidance on how to apply the vulnerability factors.</p>
<p>B)(iv) an observed, inferred or projected decrease in any one of the following:</p>	
<p>the <u>area of distribution</u>; or</p>	<p>Yes, this criterion would have been satisfied for 1964-83. It would not have been satisfied for 2002.</p> <p>If the baseline = Maximum area of distribution (spawning area), which probably occurred in 1933 (approx. 400,000 km²), then</p>

	<p>Minimum 1964-83: declined to 0.1% of the baseline Current 2002: declined to 52.5% of the baseline</p>
the area of habitat; or	
the number of <u>sub-populations</u> ; or	
the number of individuals; or	<p>Yes, this criterion would have been satisfied for 1964-83. It would not have been satisfied for 2002.</p> <p>If the baseline = Maximum spawning biomass which occurred in 1933 (4.2 million mt); this is unlikely to be anomalously high, because it is believed that stock size was even higher in earlier years, then</p> <p>Minimum 1964-83: declined to 0.12% of the baseline Current 2002: declined to 23.8% of the baseline</p>
the quality of habitat; or	
the recruitment.	<p>Yes, this criterion would have been satisfied for 1964-83. It would not have been satisfied for 2002.</p>

C) **A marked decline in population size in the wild, which has been either** (see definitions below):

Historical extent of decline - To what extent has the population or the area of distribution (please specify which) declined since historical times (i.e., going back 100 years or more if known; else based on whatever information is available)? (Ex. The ___ has declined down to ___% of the historical levels of ___ years ago.)

Recent rate of decline - Characterize the recent (10-20 year) trends in population size or area of distribution (please specify which).

For Historical Extent of Decline:

This criterion would have been satisfied for 1964-83

It would not have been satisfied for 2002

For Recent Rate of Decline:

This criterion would have been satisfied for 1964-83

It would not have been satisfied for 2002

Historical extent of decline

(A) If baseline = Maximum spawning biomass which occurred in 1933 (4.2 million mt); this is unlikely to be anomalously high, because it is believed that stock size was even higher in earlier years, then

Minimum 1964-83: declined to 0.12% of the baseline

Current 2002: declined to 23.8% of the baseline

(B) If baseline = Maximum area of distribution (spawning area), which probably occurred in 1933 (approx. 400,000 km²), then

Minimum 1964-83: declined to 0.1% of the baseline

Current 2002: declined to 52.5% of the baseline

Recent rate of decline

Spawning biomass declined by 98.1% from 1954 to 1964

Spawning biomass declined by 99.6% from 1944 to 1964

Spawning biomass increased 84.4 times from 1992 to 2002

Spawning biomass increased 200 times from 1982 to 2002

	<p>Comments:</p> <p>Sardines are considered to have high productivity, but also extremely high variability. They would fit into the 5-10% category for the historical extent of decline criterion (as laid out in detail in the Annex 5 footnote for commercially-exploited fish stocks), and could even fall below the 5% lower bound. Thus, depending on the baseline used, they could have met this decline criterion AND the current Annex 5 numeric guidelines during the 1964-83 period. They were at extremely (dangerously?) low levels for about 30 years. Some scientists with management-related responsibilities thought they should have been listed under the U.S. Endangered Species Act. However, the population has recently increased considerably and would not now meet the historical extent of decline criterion.</p> <p>It would be useful if Annex 5 gave more guidance on how to define historical baselines for assessing the historical extent of decline, how to define and measure population “productivity”, and a rationale for the choice of the 5-30% range for historical extent of decline, as well as better guidance on when to use which part of this range.</p> <p>In terms of recent rate of decline, the sardine population would easily have satisfied the decline criterion and the Annex 5 numeric guidelines (50% in 10 years or three generations, whichever is the longer; or is it 50% in 5 years or two generations, whichever is the longer? – note the transcription error in going from Resolution Conf. 9.24 to the current text, in which the time frames for average populations and small populations have been inadvertently switched) during the 1964-83 period. However, a decline of 50% in a fish population is rarely considered to be problematic, unless the stock has already experienced substantial decline. Therefore, it is essential to track declines from as far back in history as possible.</p> <p>The criterion “a high <u>vulnerability</u> due to the species' biology or behaviour (including migration)” should be added to the list under C, as it is for A and B.</p>
<p>C)(i) observed as ongoing or as having occurred in the past (but with a potential to resume); or</p>	<p>This criterion would have been satisfied for 1964-83 It would not have been satisfied for 2002</p>
<p>C)(ii) inferred or projected on the basis of any one of the following:</p>	

<ul style="list-style-type: none"> • a decrease in area of habitat; or 	
<ul style="list-style-type: none"> • a decrease in quality of habitat; or 	
<ul style="list-style-type: none"> • levels or pattern of exploitation; or 	<p>This criterion would have been satisfied for 1964-83 (exploitation rates were far too high). It would not have been satisfied for 2002</p>
<ul style="list-style-type: none"> • threats from extrinsic human-induced factors such as competition/predation by introduced species or the effects of hybridization, toxins and pollutants; or 	
<ul style="list-style-type: none"> • a decreasing recruitment 	<p>This criterion would have been satisfied for 1964-83 It would not have been satisfied for 2002</p>
<p>D) If not included in Appendix I, is likely to satisfy one or more of criteria A-C within 5 years?</p>	

For criteria **A)(v)** and **B)(iii)**, please check which if any of the vulnerability factors listed below apply:

- | | | |
|---|---|--|
| <input type="checkbox"/> low fecundity | <input type="checkbox"/> specialized niche requirements (e.g. diet and habitat) | <input type="checkbox"/> threats from disease |
| <input type="checkbox"/> slow growth rate | <input type="checkbox"/> species associations such as symbiosis and other forms of co-dependency | <input type="checkbox"/> threats from invasive species |
| <input type="checkbox"/> high age at first maturity | <input type="checkbox"/> fragmentation and habitat loss | <input checked="" type="checkbox"/> threats from rapid environmental change (e.g. climate regime shifts) |
| <input type="checkbox"/> distorted age, size or sex ratio | <input type="checkbox"/> reduced genetic diversity | <input type="checkbox"/> selectivity of removals (that may compromise recruitment) |
| <input type="checkbox"/> complex social structure | <input type="checkbox"/> depensation (prone to continuing decline, even in the absence of exploitation) | <input type="checkbox"/> Other (please specify) |
| <input type="checkbox"/> extensive migratory behaviour | <input type="checkbox"/> high degree of endemism | |
| <input checked="" type="checkbox"/> strong aggregating behaviour (e.g., schooling) | | |
| <input type="checkbox"/> low population density (for sessile or semi-sessile species) | | |

Table 2 – Comments from reviewer on applicability of criteria for listing on Appendix II

<p style="text-align: center;">Criterion</p> <p>For your information for a species to fulfill the draft criteria for Appendix II it must meet at least one of the criteria A-D.</p>	<p style="text-align: center;">NOTES</p> <p>Whenever appropriate, indicate ways in which this criterion and definitions, explanations and guidelines could be improved and/or quantified to better suit this taxon and its relatives (If you need additional space, please use a separate sheet of paper).</p>
<p>Trade Criterion Is or may the <u>species</u> be <u>affected by trade</u>?</p>	<p>YES, the species was and is heavily traded internationally. The adjective “international” should be added before “trade”.</p>
<p>A) It is known, or can be inferred, that the regulation of trade in the species is necessary to avoid it becoming eligible for inclusion in Appendix I in the near future.</p>	<p>This criterion would have been satisfied for 1964-83 It would not have been satisfied for 2002</p>
<p>B) It is known, or can be inferred or projected, that harvesting of specimens from the wild for international trade has, or may have, a detrimental impact on the species by either:</p>	
<p>B)(i) Exceeding, over an extended period, the level that can be continued to perpetuity.</p>	<p>This criterion would have been satisfied for 1964-83 It would not have been satisfied for 2002</p>
<p>B)(ii) Reducing it to a population level at which its survival would be threatened by other</p>	<p>This criterion would have been satisfied for 1964-83 It would not have been satisfied for 2002</p>

influences.	
B) The specimens of the species in the form in which they are traded resemble specimens of a species included in Appendix II under the provisions of Article II, paragraph 2(a), or in Appendix I, such that a non-expert, with reasonable effort, is unlikely to be able to distinguish between them.	N/A
C) There are compelling reasons, other than those given in C to ensure that effective control of trade in currently listed species is achieved.	N/A

For criteria **A)** and **B)**, please check which if any of the vulnerability factors listed below apply:

- low fecundity
- slow growth rate
- high age at first maturity
- distorted age, size or sex ratio
- complex social structure
- extensive migratory behaviour
- strong aggregating behaviour (e.g., schooling)
- low population density (for sessile or semi-sessile species)
- specialized niche requirements (e.g. diet and habitat)

- species associations such as symbiosis and other forms of co-dependency
- fragmentation and habitat loss
- reduced genetic diversity
- depensation (prone to continuing decline, even in the absence of exploitation)
- high degree of endemism
- threats from disease
- threats from invasive species

- threats from rapid environmental change (e.g. climate regime shifts)
- selectivity of removals (that may compromise recruitment)
- Other (please specify)

General comments:

It would be useful if Annex 5 gave more guidance on how to define historical baselines for assessing the historical extent of decline.

It would be useful if Annex 5 gave more guidance on how to define and measure population “productivity”.

It would be useful if Annex 5 provided a brief rationale for the choice of the 5-30% range for historical extent of decline, as well as better guidance on when to use which part of this range.

Annex 5 guidelines for a marked recent rate of decline: The original Resolution Conf. 9.24 states, “... a decrease of 50% or more in total within 5 years or two generations, whichever is the longer, has been found to be an appropriate guideline (not a threshold) of what constitutes a decline. A guideline (not a threshold) of what constitutes a decline in a small wild population could be 20% or more in total within ten years or three generations, whichever is the longer”. However, Document CoP12 Com. I. 3 states “... a general guideline for a marked recent rate of decline is a percentage decline of 50% or more in the last 10 years or three generations, whichever is the longer. If the population is small, a percentage decline of 20% or more in the last 5 years or 2 generations (whichever is the longer) may be more appropriate”. Note how the time frames over which to consider decline have been switched around. “Marked decline” is now lower for a “normal” population, but a higher rate is required to qualify as “marked” for “small” population. This happened in an earlier revision of Res. Conf. 9.24 and since there was no justification given for the change, it was probably a mistake. In fact, it appears that the linkage of percentage declines and time frames may not be particularly useful. Perhaps it would be more meaningful and easier to interpret if a general guideline for a marked recent rate of decline was defined as “...an estimated or projected percentage decline of 20%-50% or more over a period of 10 years or two generations, whichever is longer. Here, the lower end of the range applies for populations that are small or have low productivity and the upper end of the range for populations that are relatively large or have high productivity”

It would be useful if Annex 5 provided guidance on what constitutes a “small wild population” that improved on the current single number of 5,000 individuals. For example, a range of, say 5,000 to 500,000 could be given, with the lower end of the range being applicable for species with low productivity and the upper end for species with high productivity; the rationale being that high productivity is usually associated with both high absolute numbers (for an undisturbed population) and high variability. However, some species would fall outside of this general range, and sardines would be one of them. The minimum viable population size for California sardine could be 10 million or higher. Better guidance could also be provided for what constitutes a “very small wild sub-population”.

The Annex 5 definition of “generation length”, while technically accurate, may not be operational (i.e., able to be put into practice). The definition implies a need to determine which of the mature individuals in the population are actually the parents of the current cohort (i.e., it would exclude adult females who did not conceive or aborted during the most recent breeding season, adult males that did not successfully inseminate females, adult “helpers”, and others).

It would be useful if Annex 5 provided more guidance on how to apply the vulnerability factors.

Acknowledgements

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References

- Barnes, J.T., L.D. Jacobson, A.D. MacCall and P. Wolf. 1992. Recent population trends and abundance estimates for the Pacific sardine (*Sardinops sagax*). CalCOFI Report Vol. 33.
- Conser, R.J., K.T. Hill, P.R. Crone, N.C.H. Lo, D. Bergen. 2002. Stock assessment of Pacific sardine with management recommendations for 2003. Executive Summary. Pacific Fishery Management Council, Portland, Oregon.
- Jacobson, L.D., J.A.A. DeOliveira, M. Barange, M.A. Cisneros-Mata, R. Felix-Uraga, J.R. Hunter, J.Y. Kim, Y. Matsuura, M. Niquen, C. Porteiro, B. Rothschild, R.P. Sanchez, R. Serra, A. Uriarte, and T. Wada. 2001. Surplus production, variability, and climate change in the great sardine and anchovy fisheries. *Canadian Journal of Fisheries and Aquatic Sciences* 58:1891-1903.