

Working Paper No. 2017-02

**ASSESSING IMPACTS OF THE CLOSED FISHING
SEASON POLICY FOR SARDINES IN ZAMBOANGA
PENINSULA, PHILIPPINES: An Interdisciplinary Approach**

*Agnes C. Rola, Mario Rio A. Naguit, Teresita A. Narvaez,
Dulce D. Elazegui, Bing Baltazar C. Brillo, Merlyne M. Paunlagui,
Hadji C. Jalotjot and Catherine P. Cervantes*

Center for Strategic Planning and Policy Studies
(formerly Center for Policy and Development Studies)
College of Public Affairs and Development
University of the Philippines Los Baños
College, Laguna 4031
Philippines

Telephone: (63-049) 536-3455

Fax: (63-049) 536-3637

Homepage: <https://cpaf.uplb.edu.ph/>

The CSPPS Working Paper series reports the results of studies by the Center researchers and CPAf faculty, staff and students, which have not been reviewed. These are circulated for the purpose of soliciting comments and suggestions.

The views expressed in the paper are those of the authors and do not necessarily reflect those of CSPPS, the agency with which the authors are affiliated, and the funding agencies, if applicable.

Please send your comments to:

The Director

Center for Strategic Planning & Policy Studies (formerly CPDS)

College of Public Affairs and Development

University of the Philippines Los Baños

College, Laguna 4031

Philippines

Email: mmpaunlagui@up.edu.ph

ABSTRACT

This project assessed the impact of the closed season policy imposed on sardines in the Zamboanga Peninsula for the months of December 1 to March 1, to allow for a more productive spawning season. The policy was formulated to address the declining fish catch of sardines, as revealed by the landed catch. The theory of change reflected the policy analysis lens. Policy inputs were the resources for monitoring compliance to the policy and information campaign to elicit community and other stakeholders' support. Policy output is the change in fish stock while the policy impacts include increase in landed catch, effect on the incomes of factory workers, increase in net incomes of fishers and other stakeholders and increase in societal benefits, in general.

Primary and secondary data were gathered to analyze impacts in the various sectors. Secondary data came from the Philippine Statistical Authority and the canneries and the bottling companies. Primary data were gathered through household surveys, key informant interviews, and focus group discussions with various stakeholders. The social welfare analysis synthesized the study results.

Results showed that there was an increase in landed catch of sardines after the policy implementation and that the values of catch were higher due to the increase in catch of high value non-sardine species. Wages of fishing crew increased. Factory wages declined during the months of December to February, although working hours and days increased during open season. Factory workers found alternative livelihoods during the closed season. On the whole, there is positive impact to society. Thus, the authors recommend that closed season policy be continued while also considering other complementary strategies for fisheries management to address spill over effects and trade offs. In investigating the effects of overfishing and changing climate to sardine stocks, evaluation of the impacts of the closed season policy requires long-term records of their population and distribution.

Keywords: sardines, closed season policy, impact evaluation, landed catch, Zamboanga Peninsula, Philippines

TABLE OF CONTENTS

	Page
I. Introduction	1
II. The Theory of Change: Societal Impacts of Closed Season Policy	3
III. Methodology	4
3.1 Role of institutions and the factors facilitating or constraining implementation of the closed fishing season	5
3.2 Assessment of the attitudes of the communities before, during and after the policy implementation of the closed fishing season	5
3.3 Assessment in the change in landed catch as a result of the policy implementation	5
3.4 Impact on the processing and manufacturing of sardines	6
3.5 Impact on income and livelihood (employment) of the affected fisher folks and other relevant stakeholders	6
3.6 Estimation of the net benefits to society as a result of the policy	7
IV. Results and Discussion	7
4.1 Policy inputs: Facilitating and constraining factors	7
4.2 Policy process: Knowledge and perceptions of fishing communities on the close season policy	9
4.3 Policy output: Analysis of trends in landed catch	10
4.4 Policy impact: Analysis of trends in incomes of sardine processors	13
4.5 Policy impact: Changes in household incomes and employment of fishers and factory workers	18
4.6 Social welfare impacts of the closed season policy	23
V. Conclusion and Recommendations	25
VI. Literature Cited	28

List of Tables

	Page
Table 1. Value of landed catch (in PhP 000), sardines and other species, Zamboanga Peninsula, before and after the closed season policy, in constant 2015 prices.	12
Table 2. Annual income before and during closed fishing season policy.	20
Table 3. Average volume (and value) of the recent fish catch of municipal fisherfolks by composition and type of fish catch	21
Table 4. Average annual income of commercial fishing households by location and income source type	22
Table 5. Average volume (and value) of the recent fish catch of commercial fishing vessels by composition and type of fish catch	22
Table 6. Social benefit cost analysis of the closed fishing season policy, Zamboanga Peninsula (2015=100)	24

List of Figures

	Page
Figure 1. Location of the Zamboanga Peninsula	1
Figure 2. Closed fishing season policy and theory of change.	4
Figure 3. Patterns of quarterly landed catch of sardines with relative contribution of municipal and commercial fishing gears in 19 stations in Zamboanga Peninsula.	10
Figure 4. Volume of canned sardines production in Zamboanga City	13
Figure 5. Volume of bottled sardine production in Zamboanga del Norte, 2015	14
Figure 6. Total number of cannery workers in Zamboanga City, 2008-2015	15
Figure 7. Total number of bottled sardines workers in Zamboanga del Norte	16
Figure 8. Average annual gross income of sardine industry and allied industry workers, by period	17

ASSESSING IMPACTS OF THE CLOSED FISHING SEASON POLICY FOR SARDINES IN ZAMBOANGA PENINSULA, PHILIPPINES: An Interdisciplinary Approach

Agnes C. Rola, Teresita A. Narvaez, Maria Rio A. Naguit, Dulce D. Elazegui,
Bing Baltazar C. Brillo, Merlyne M. Paunlagui, Hadji C. Jalotjot, and
Catherine P. Cervantes

I. Introduction

A canned sardine is considered as one of the basic food items in the Philippines. Sardine is an inexpensive source of protein for poor households. Filipinos prefer this food item as it is nutritious, cheap and is a delicious complement to rice, which is the staple food in the country. Zamboanga Peninsula (ZamPen), Philippines (Figure 1) is the center of the country's sardine industry producing 50 to 60% of the country's annual total sardine production in the last 10 years. The sardine industry based mostly in Zamboanga City includes fishing companies (19), canning companies (8) and tin can manufacturers (3). The canning industry alone employs around 15,000 workers who process 1,000 tons of sardines daily.



Figure 1. Location of the Zamboanga Peninsula

While ZamPen remains as the top sardine producer in the country, its production level and production growth rates is inconsistent– alternate positive and negative growth rates – with peak production recorded in 2009 after which production started to decline. In 2011, sardine harvest recorded a serious decrease – of almost 50% from the previous year, which threatened the sardine industry in the region.

The declining fish catch called for better management of fisheries resources specifically to improve the existing fish stock in the affected areas. In 2011, the Department of Agriculture (DA) and the Department of Interior and Local Government (DILG) issued Joint DA-DILG Administrative Order No. 1 series of 2011 (JAO-01 s.2011) establishing a conservation area in ZamPen where a closed fishing season for commercial-scale harvest of sardines was to be enforced for three months every year for a period of three years starting December of 2011. The no-fishing zone has an area of 13,987 square kilometers covering East Sulu Sea, Basilan Strait, and Sibuguey Bay encompassing the western municipal/national waters of Zamboanga Del Norte, the waters bordering south and eastern waters of Zamboanga City and southern portion of Zamboanga Sibugay. JAO No. 1 ended in March 2014, but the closed season policy was continued through BFAR Administrative Circular (BAC) No. 255 dated November 15, 2014. Initial reports and claims suggest positive impacts specifically on fish catch.

Mardle, Pascoe, and Herrero (2004) elaborate several cases of management of fisheries and discuss the pursued objectives. They demonstrate that the management policies pursue three types of objectives: (ecological) conservation, socio-economic performance (employment, income, profit, economic stability and development) and institutional arrangements (stakeholder relations and involvement). It is difficult to monetise the full costs and benefits arising, and hence the overall financial impact of fishery regulatory policies (Attrill et al. 2012). Difficulties also stem from the complexity and the corresponding degree of imprecision when trying to predict the impact of policy changes on the biological and economic systems (Sanchirico 2000).

A closed fishing season is just one of the many fisheries management approaches adopted by the state, local authorities and coastal communities to conserve and improve fish stocks and other marine resources. A seasonal closure and harvest of fisheries products has become an acceptable and implementable means of sustaining both ecosystem function and livelihood (Cohen, Cinner, & Foale, 2013). It can involve area/space or time restrictions or both (spatio-temporal). Fishing bans are usually implemented as part of marine protected areas (MPAs) and in conjunction with other measures (e.g., gear restrictions, fishing quotas, fishing vessel licensing and regulations). However, there are areas that enforce closed season outside an institutionalized MPA such as the closed fishing for tuna in Davao Gulf, Philippines.

Closed fishing season, “no take zones”, and MPAs are established primarily due to the deteriorating coastal resources. The deterioration is manifested by lower yield or fish catch which consequently results in significant social and economic

impacts in the affected community. In the Philippines, exploitation of the fishery resources is a result of interlinked factors including poverty in the coastal areas (Adan, 2009) which is prevalent in most coastal fishing communities in the country. Over or excess capacity driven by over population, poverty, market incentives, and policies which result in resource use conflicts is also a contributory factor (Ahmed, Salayo, Viswanathan, Garces, and Pido, 2006). Resource use conflicts then result in over fishing, environmental degradation, and threats to food security. Conflicts among different stakeholders are time-consuming and increase the cost of information and policy change (Fernandez, 2006).

Closed fishing season presents potential conservation and other spill-over benefits but oftentimes met with mixed perceptions and sometimes opposition especially where significant portion of the livelihood is affected. This is a concern since perceptions of benefit is an incentive for support and success of MPs (Bennett and Dearden, 2014a). Barley, Kincaid and Rose (2014) showed that support for closures from fisherfolks-based on local knowledge is more likely to meet fishery and conservation goals than those who do not. On the other hand, lack of support is usually due to negative perceptions often related to loss of fishing and other livelihood except when regulations are not applied (Bennett and Dearden, 2014b).

This paper reports on the results of the study that determined the impacts of the closed season policy to fishers, processors, and households; and presents recommendations to conserve the sardine stock. The paper contains five sections. The second section describes the theory of change that guided the study; the third discusses the multi-disciplinary methodology; the fourth presents the results and discussions; and the last section shows the conclusions and recommendations.

II. The Theory of Change: Societal Impacts of Closed Season Policy

Analyzing the impacts of the closed fishing season policy was guided by the theory of change (Figure 2). The situation leading to the policy was reduced sardines fish catch due to the catching of juvenile and spawning sardines. Theoretically, reduced fish stock could also be caused by over exploitation to feed the increasing human population and biophysical factors such as changes in ocean water temperature.

The policy intervention was the declaration of the closed fishing season which basically prohibits fishing of sardines using specific commercial fishing gear during the spawning season (December 1 to March 1) and marketing sardines obtained from the conservation area during the said period. Policy implementation consists of two manipulable actions: policy inputs and policy processes (Dunn, 2004). Policy inputs include investments in institutional support such as increased personnel for enforcement and monitoring. Policy processes involve the formulation and design of the policy instrument e.g., the joint circular, setting the 'rules of the game' or implementing mechanisms; and monitoring and evaluation of the outcomes, and

gathering community support for proper awareness and a more participatory approach to the entire policy process.

Controlled policy outcomes consist of policy output and policy impacts. Policy output will be in terms of the improvement in the fish stock due to the policy intervention. This should be monitored every year of the policy implementation. Policy impacts are improvements in catch per unit effort annually, increased supply to the sardines' agri-business firms, and increased annual net incomes of fishers and other stakeholders.

The analysis also took into account the spill-overs; externalities that can be positive or negative. Spill-overs can be in the form of increased value of catch as a result of increase in the volume of non-sardines species that are high valued. Spillovers can also be the negative effects on municipal fishers who are strictly not affected by the policy; but due to limited knowledge by the community, some local governments also penalize the municipal fishers for catching sardines during the closed season. Social welfare effects can be gleaned from the externalities as well as effects to the various stakeholders.

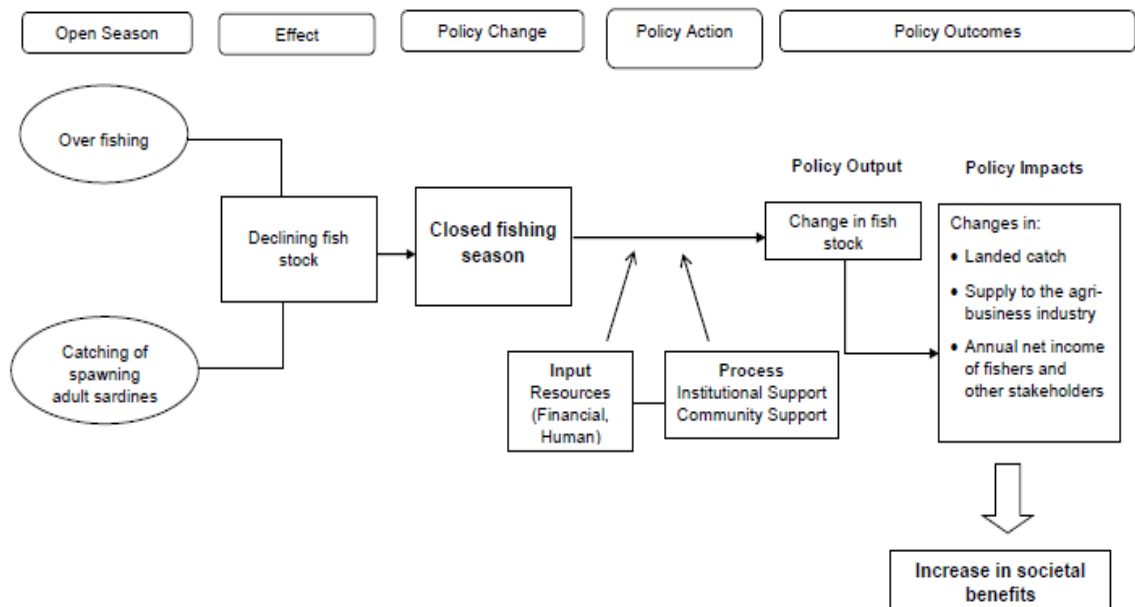


Figure 2. Closed fishing season policy and theory of change

III. Methodology

The societal costs and benefits consist of social, economic and ecological costs and benefits (Failler and Pan 2007). The economic costs and benefits of fishing activity along the production chain of fisheries span from fish harvesting to processing and to marketing. These economic costs and benefits are linked to the

social and ecological systems. The linkage between social and economic systems is made through income distribution. The linkage between economic and ecological systems is made through the change of biomass stock. And, the linkage between social and ecological systems is made through environmental problems and protections (Failler and Pan 2007).

An interdisciplinary team was organized to analyze the impact of the closed season policy. These include a biologist, agribusiness expert, policy and institutional experts, socio-economists and sociologist. Both primary and secondary data were generated. The data description, data collection methodology and data analysis are found in Naguit 2016, Narvaez 2016, Brillo et al. 2016, Jalotjot and Cervantes 2016, Paunlagui 2016, and Rola et al. 2017 and briefly described below.

3.1 Role of institutions and the factors facilitating or constraining implementation of the closed fishing season

The institutional component involved collection of primary and secondary data pertinent to the formulation and implementation of the closed season policy. Sources of secondary data included various publications such as research reports, documents, and records of government and other agencies pertinent to fishery sector. Primary data collection was through key informant interview (KII) of representatives from agencies involved in the implementation of the closed season policy. The study team conducted a total of 18 KIIs - two (2) KIIs in BFAR Central Office, one KI in the Department of Interior and Local Government (DILG) Provincial Office in Dipolog, Zamboanga del Norte; one KI from the Technical Working Group; and fifteen (15) KIIs in BFAR offices, LGUs and other agencies in Zamboanga City and Zamboanga del Norte. Two Focus Group Discussions (FGDs) in Zamboanga City and Zamboanga del Norte involved representatives (e.g., Fishery Technician, Fishery Officer) from the LGUs.

3.2 Assessment of the attitudes of the communities before, during and after the policy implementation of the closed fishing season

Data on the knowledge, attitudes and perceptions were generated during the household survey and using the Likert scale format. Follow up focus group discussions were organized to gather more information to explain the results of the Likert scale. Two community level focus group discussions with workers and another two focus group discussions with fishers were conducted.

3.3 Assessment in the change in landed catch as a result of the policy implementation

The compilation of logbook data from a single ring net operator with three to four fishing vessels for the period of 2008 to May 2016 operating in the Northern Zamboanga Peninsula was examined. The fishing vessels used the same fishing gear and have similar technical characteristics (length, weight, and material). It is assumed that the average catch per unit effort (CPUE) represented a similar density of fish.

This dataset covers the northern Zamboanga Peninsula where upwelling occurs during the Northeast monsoon months. The CPUE is the daily catch rate (in kg/trip), which is interpreted as a measure of relative abundance. Also, secondary data of landed catch were taken from the Philippine Statistics Authority (PSA) and were disaggregated into sardines and other species across municipal and commercial fishers. Trend was achieved by means of the curvilinear regression model (using e-views) Anomalies were also determined by the differences between the grand mean value for six years and the mean monthly catch rate of sardines.

3.4 Impact on the processing and manufacturing of sardines

This component used value chain¹ approach/framework in evaluating the direct and indirect effects of closed fishing season policy of sardine to stakeholders and major industries in Zamboanga Peninsula. Analysis of the value chain includes two major steps: industry assessment of existing market and the value chain mapping. The assessment study covered two major sardines producing areas in Zamboanga Peninsula, namely Zamboanga City and Zamboanga del Norte. The socio-economic impact of the closed season was also analysed.

Tracer methodology was employed to identify respondents from commercial and municipal fisherfolks, canning and bottling processors, production workers in cannery and bottling companies and institutional buyers. Primary data were gathered through survey of nine (9) out of twelve (12) canning processors in Zamboanga City and twenty-five (25) bottling processors in Zamboanga del Norte. Twenty-three (23) municipal fisherfolks were in three major areas of Zamboanga del Norte, specifically in the municipalities of Roxas, Katipunan, and Dipolog City were also interviewed. Survey of industry workers in Zamboanga City and Zamboanga del Norte covered thirty (30) cannery workers, thirty (30) bottling workers, thirty (30) ancillary workers in the tin can industry and thirty (30) commercial fishing crews. Interviews were also carried out with representatives of from major stakeholders such as: (1.) Southern Philippines Deep Sea Fishing Association (SOPHIL); (2.) Industrial Group of Zamboanga, Inc. (IGZI) and, (3) In-Glass of Dipolog Associations (ISDA).

3.5 Impact on income and livelihood (employment) of the affected fisher folks and other relevant stakeholders

From the society's point of view, an interesting question is on what has happened to the households and their livelihoods within the three months that they are out of work in the factories. A related issue is the impact on commercial fishers and level of benefits to municipal fishers as they are not affected by the law. For fisheries workers, the primary impact indicator is change in number of working days and/or income resulting from the closed fishing season. For fishers, the change in income is based on changes in income from the sardine catch.

¹A value chain is a set of activities that a firm operating in a specific industry performs in order to deliver a valuable product or service for the market. The concept comes from business management and was first described and popularized by Michael Porter in his best-seller, *Competitive Advantage: Creating and Sustaining Superior Performance* in 1985.

Alternatives sources of income, the training, seminars, and other capacity-building activities attended by the respondents in relation to the policy were also studied. Information on the following were also generated: a) changes in income source, i.e., type of economic activity; b) change in income for those who permanently shifted work from sardines to non-sardine work; and c) labor movement/recruitment during transition from closed to open season and vice-versa. In addition, coping strategies of the affected households were also assessed.

Household survey was undertaken to cover both the household level impacts and the knowledge, attitudes and perception component of the study. It included 301 households in Zamboanga City and Zamboanga Del Norte categorized into municipal fishers (172), commercial fishers (6) and fisheries workers (129). Survey respondents were selected using purposive sampling.

3.6 Estimation of the net benefits to society as a result of the policy

Data from the various components as above were used to determine the social benefits and costs of the closed season policy. Data for benefits included value of landed catch before and during the policy, increased incomes from alternative sources, and increased in incomes of fishery crew due to intensive operations during the open season. The value of landed catch during the closed season months also included the high valued species. Data for costs include the decline in the incomes of factory workers due to the closed season, or stoppage of factory work for three months; decline in value of landed catch of commercial fishers and increased cost of regulations. Data were expressed in 2015 prices and benefit cost ratio was estimated. No investment data were analyzed, thus Net Present Value was not generated.

IV. Results and Discussion

Following the theory of change framework, the results and discussion in this section is organized into policy inputs and process, policy output (landed catch) and policy impacts to fishing crew, sardine processors, factory workers, municipal and commercial fishers.

4.1 Policy Inputs: Facilitating and constraining factors

Policy design occurred at the national level and went through a fragmented, multi-sectoral process that happened in a policy environment that is factional and contested, as in the case of the sardine canneries and bottlers; the fishery workers, and fishers. Temporal dimension, e.g., timing or timeliness (such as the spawning period of sardines) of the implementation of the policy is also important. The policy formulation process was also found to be not participatory such that people were not able to respond initially. A technical working group was formed and was composed of representatives from academic institutions, industry, national/regional government agencies, and local government units to basically monitor performance of the policy.

Factors facilitating implementation of the closed season is the direct involvement of the national agency Bureau of Fisheries and Aquatic Resources (BFAR) that provided most of the needed resources, e.g., financial, personnel. Monitoring, control, and surveillance is a regular activity of BFAR, thus, it was also able to mobilize the needed patrol vessel and support of other government agencies. Visibility of policy enforcers was important in ensuring compliance with the closed season. The cooperation of local government units also facilitated the implementation of the policy, particularly the ban on catching and marketing, in their respective areas. Support of other agencies in providing alternative livelihood or facilities (e.g., cold storage, fishing gear for non-sardine species) to the affected stakeholders tamed the impact of the closed season. Participation of other interest groups such as the sardine cannery and bottling sectors and the academe which provided scientific information both in the design and evaluation of the closed season also facilitated the policy process.

On the other hand, there were also some issues that constrained implementation of closed season, particularly in the first year of implementation. There were local government units reporting that JAO AO No. 1, s. 2011 lacked clarity, consistency, and coherence in some of its provisions and implementing mechanisms. They lamented that dissemination of information for them to be clarified about the policy was lacking, resulting in misunderstanding, confusion, and lack of preparation in enforcing the policy. There were also feedback about the difficulty of monitoring the large conservation area and many landing centers covered by the closed season. There were LGUs which do not have sufficient resources to implement the policy. Meanwhile, there were also other agencies which did not push through with their commitment to support the displaced workers during the closed season.

4.2 Policy Process: Knowledge and Perceptions of Fishing Communities on the closed season policy

4.2.1 Knowledge on closed season policy

Majority of the respondents were aware of the closed season fishing policy. More workers than fishers are knowledgeable of the policy because they are directly affected. The lack of detailed knowledge about the closed fishing season policy is revealed in the responses where less than half of the fishers and about two-thirds of the factory workers correctly identified the months of December to February to be covered by the closed fishing season policy. There were respondents who gave completely wrong answer, e.g., months of June, November, and every month. The response of every month, particularly in Zamboanga del Norte, was due to the traditional practice where fishers do not fish three days after the full-moon long before the implementation of the policy.

A very low percentage of the respondents learned about the policy from the Municipal Agriculture Office. In fact, none of the commercial fishers learned the

policy from the local government unit. The explanation can be that it is more of the BFAR and other government agencies which are involved in the enforcement of the policy, although the local government unit is a partner in the enforcement.

4.2.2 Perceptions of fishers and workers on the closed fishing season policy

Most fishers were not sure that it has increased work in the canning factory; but of course most factory workers agreed of this increase in work load. Some participants of the focus group discussion reported that hours of work in the sardine cannery start to decline by August and further reduced during November. During this period, all the factory workers report for work but at less number of hours to give everyone the chance to earn.

One factory worker did not want the closed fishing season policy because of the difficulty in finding alternative livelihood opportunities during the three-month ban to fish sardines. According to him, before the policy he only stops working around five days a month when there is full-moon or when the catch is low. This means that they have continuous work for 12 months and does not need to find alternative work when everyone also looks for work.

However, when asked if they were in favor of the closed fishing season policy, the response was highly positive. Half of the respondents strongly favored its implementation while 33 out of 100 commercial fishers were also in agreement. Only less than 10% of the respondents did not favor its implementation. Municipal fishers also reported an increase in the fish catch in Zamboanga del Norte, which is a positive externality enjoyed by the municipal fishers who are mostly the poor, marginalized fishers.

4.3 Policy Output: Analysis of Trends in landed catch

4.3.1 Volume of landed catch

Annual sardine production in Zamboanga Peninsula is estimated at around 5,990 mt with *S. lemuru* as the dominant species (91%). There is an observed increasing trend in sardine production and catch rates in the area with a significant change in landed catch of sardines before and during the implementation of the fishing closure (Figure 3). In addition, an increase in the frequency of large-sized *S. lemuru* has been observed recently, which may imply that the fish stock is recovering from intensive exploitation. The increase in landed catches (production and daily catch rate) of sardine species and increase of large-sized sardines stress the positive impacts of closed season policy.

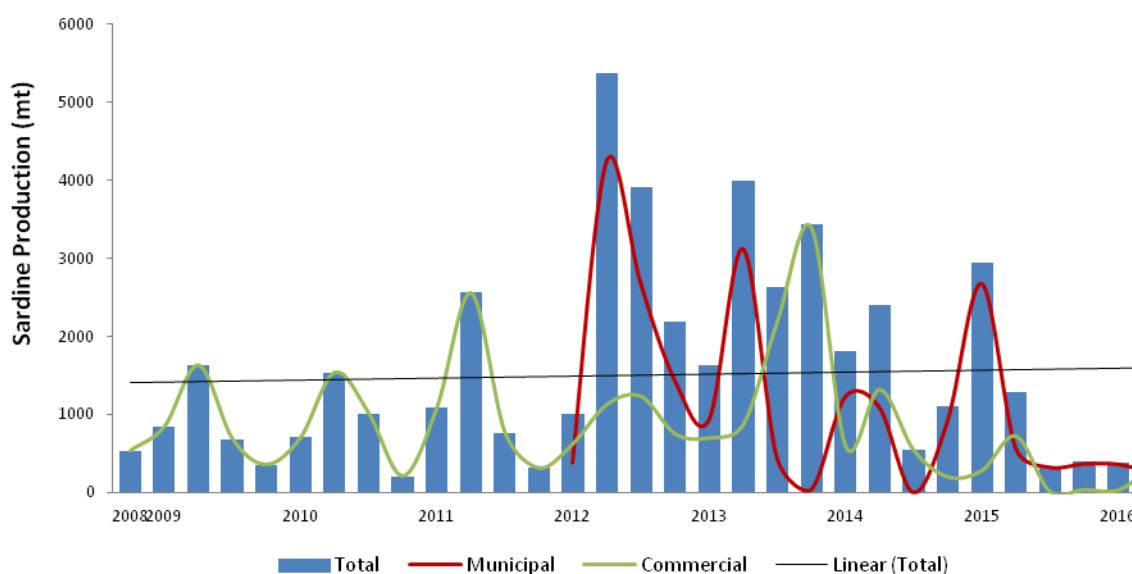


Figure 3. Patterns of quarterly landed catch of sardines with relative contribution of municipal and commercial fishing gears in 19 stations in Zamboanga Peninsula.

Bali sardines caught off the Zamboanga Peninsula attain sexual maturity at 4 to 6 months which is earlier compared to the traditional belief (one year). Intense fishing may force the population to mature at smaller size (younger age) in order to ensure survival of the species. The absence of historical baseline data on the age structure of Bali sardine caught off the Zamboanga Peninsula makes it difficult to assume that there has been a shift in the age-at-maturity of the population, although there is a substantial fishery exploiting the sardines at all life stages in these areas. Majority of adult sardines spawning in both northern and southern Zamboanga Peninsula during the northeast monsoon were hatched from July to September 2015. This is consistent with previous findings on the hatch dates of mature fish spawning off Northern Zamboanga during the NE monsoon from November 2013 to March 2014 with a mean age of 145.4 days or 4.8 months old.

Larvae spawned in the northern upwelling area during the NE monsoon are transported southwards, perhaps as early juveniles as early as March. The mechanism for this is not clear, but ichthyoplankton studies in early 2014 suggest a southward transport of larvae, perhaps close to the coast of the mainland (Piloton, Felix and Campos, 2015) at this time. After 2-3 months, these juveniles may reach maturity in the south and make up the bulk of spawners from May to September. The larvae they produce during these months may be transported northwards with the SW monsoon in time to attain maturity by the beginning of the NE monsoon months, when spawning is timed with conditions of high productivity resulting from upwelling. This scenario fits well with back-calculated hatch dates of spawners in the north. Whether this proposed coupling takes place or not needs to be further investigated. Since the dynamics of stocks appear to be different at either end of the Peninsula, the large difference in fishing pressure on sardines between the two areas will also have an effect on these dynamics.

Hence, assessing the effects of the seasonal closure on the stocks may require a more sophisticated design for collecting data. The spawning areas and times are crucial to the reproductive success of the fish stocks. From the perspective of fishes, these spawning areas and periods are the most vital in their life history and also the most vulnerable to negative external impacts (Olsen et al., 2010).

In addition, sardine production in Zamboanga Peninsula is largely influenced by environmental factors indicated by its strong seasonality. High estimates of sardine production appear to be preceded by peaks in chlorophylla levels during the northeast monsoon, however, there is a lag phase with biomass generation of sardines. Sardine population spikes in March which is right after the main spawning during the northeast monsoon each year. Moreover, results of this study prove that at smaller scale, although El Niño events would induce massive die-offs in anchovy which are adapted to cold, nutrient-rich coastal waters, the populations of sardine (and of other species like jack mackerel or mackerel), which live in the warmer waters, would experience an upsurge in number during or just after these episodes. The remarkably high sardine production recorded in Zamboanga Peninsula during the El Niño years in 2005, 2009, 2010 and 2014-15 (drought).

4.3.2 Overall Catch Species Composition

There were a total of 58 species belonging to 27 fish families identified from landed catches of ringnets, dominated by family Carangidae (jacks and trevallies) (40%), followed by family Clupeidae (sardines and herrings) (34.6%). Family Scombridae (tunas and mackerels) was observed at relatively low proportion (<14%). On the other hand, municipal landed catches were composed of 49 species and largely represented by family Clupeidae (42%), Scombridae (26%) and Carangidae, while other fish families (about 48 families) were observed at relatively low proportion (13%)

The Scombrids (nine species), Clupeids (two dominant species) and Carangids (four dominant species) dominated the catch for the past 13 years. The Scombrids comprised 36% and 40% of the total commercial fisheries before and after the first implementation of the sardines fishing ban in December 2011 to March 1, 2012. The sardines ranked the third with the largest production prior to 2012 but was second, thereafter. In terms of species, *Decapterus macrosoma* (roundscads) of the Family Scombridae consistently topped the highest production volume. The Bali sardines, although it only ranked second before the ban implementation, has displayed improvement after 2012 where it equaled with the roundscads.

On the other hand, the tuna and mackerel families comprised the greatest bulk of the municipal fisheries production in the country. The sardines ranked third all throughout the past 13 years. In terms of species, *Selar crumenophthalmus* (bigeye scad) and *Leiognathus* sp (slipmouths) were the top mostly caught ones, followed by *Carangoides* spp (trevally) and *Thunnus obesus* (bigeye tuna).

4.3.3 Value of sardines and other species catch

The values of landed catch of both sardines and other species have generally increased during the closed season period (Table 1). The commercial fishers experienced a slight decline in both sets of species, it was found that the municipal fishing had enjoyed the benefits due to the closed season. Both values of sardines and other species increased during the closed season in the municipal fishing industry. However, on the whole, values have increased for both types of species.

Table 1. Value of landed catch (in PhP 000), sardines and other species, Zamboanga Peninsula, before and after the closed season policy, in constant 2015 prices.

Year	Commercial		Municipal		Total	
	Sardines	Other Species	Sardines	Other species	Sardines	Other Species
2007	5,269	70,545	171	1,391	5440	71936
2008	7,209	73,697	153	1,310	7362	75007
2009	8,938	65,614	152	1,263	9090	66877
2010	8,175	58,253	146	1,183	8321	59436
2011	7,544	59,049	135	1,143	7679	60192
2012	6,993	65,357	127	1,051	7120	66408
2013	6,212	68,270	124	998	6336	69268
2014	7,086	60,650	113	931	7199	61581
2015	5,176	33,552	4,796	41,152	9972	74704
Average Annual Value 2007-2011	7427	65,431	151	1258	7578	66690
Average Annual Value 2012-2015	6367	56,957	1290	11,033	7657	67990
(2012-2015)-(2007-2011)	-1060	-8474	1139	9775	79	1300

Source of data: Philippine Statistical Authority

4.4 Policy Impact: Analysis of trends in incomes of sardine processors

4.4.1 Volume of Processed Sardines

Canned Sardines

Based on data shown in Figure 4, the trend of local production of canneries increased during the closed fishing season (C.Y. 2012-2013) by about 9.5% from the previous period of 2008 to 2010. According to Mr. Ariel Onesa, President of Industrial group of Zamboanga, Inc. (IGZI) also the Plant manager of Century Pacific Foods Corporation, the factors that caused the increase in the production of sardines canned goods were higher catch of sardines, decreased price of diesel, lower price of fresh sardines as a result of high production and the preparedness of sardines canning factories for the closed fishing period and the growth of fish meal industry. Generally, the trend on local canned sardines production is increasing by about 2% per year (KII with Ariel Onesa, 2015).

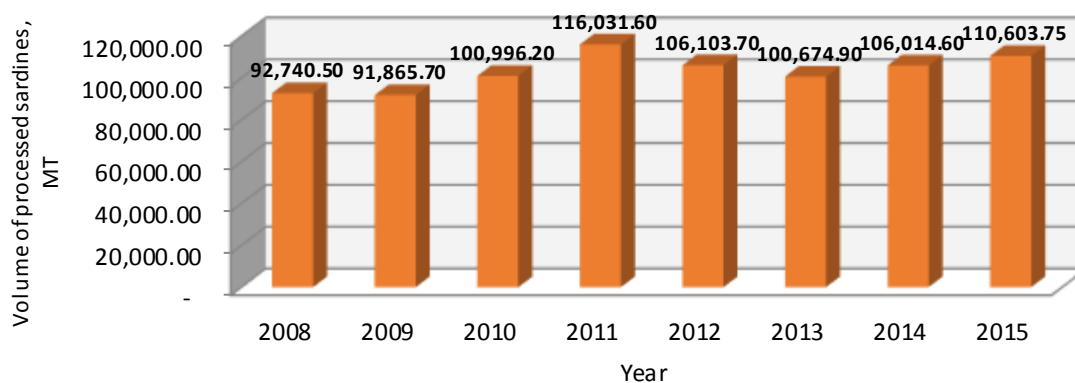


Figure 4. Volume of canned sardines production in Zamboanga City
 Source: AC Nielsen survey, 2015

Industry survey data showed that the average cases of products produced by the canning industry were 4,014,613 during the period of ‘no closed fishing’. Significant increase of 50% was recorded during the enforcement period of the JAO-01 policy. The KII with some plant managers revealed that companies tend to expand their production capacity as a result of the shortened production of nine (9) months to compensate for the loss of three months’ production during the closed fishing season. Likewise, canning companies store sufficient volume of finished products two to three months ahead in preparation of the ‘no production’ period.

The average yearly cases of canned products for all the canning companies in Zamboanga City also showed significant increase of 50% during the implementation of the closed fishing season. To catch up with the demand volume of canned sardines from both local and export buyers in only 9-month production period, canneries invested in expanding their facilities to accommodate more workers and more volume of fish to be processed. Some canneries constructed additional storage facilities, while others rented such facility in the nearby economic zone about 3 km distance. To the canning operators, the closed fishing season resulted to additional investment cost as well as storage, inventory and handling cost. Data for these investments were however, not available.

Bottled Sardines

Bottled sardine processors showed increasing volume of production (Figure 5) prior to and during the implementation of the JAO-01 (2012-2015). The 17 bottled processors revealed a total of 297,740 cases of sardines’ products with 24 bottles per case per year prior to JAO-01, this volume increased during the enforcement of the closed fishing season policy (2012 to 2015) to 322,250 cases indicating an 8.23% increase from the period of ‘no closed season’. Among the top producing manufacturers are Montaña Foods Corporation, Mendoza Industries, and Zaragoza Food Products.

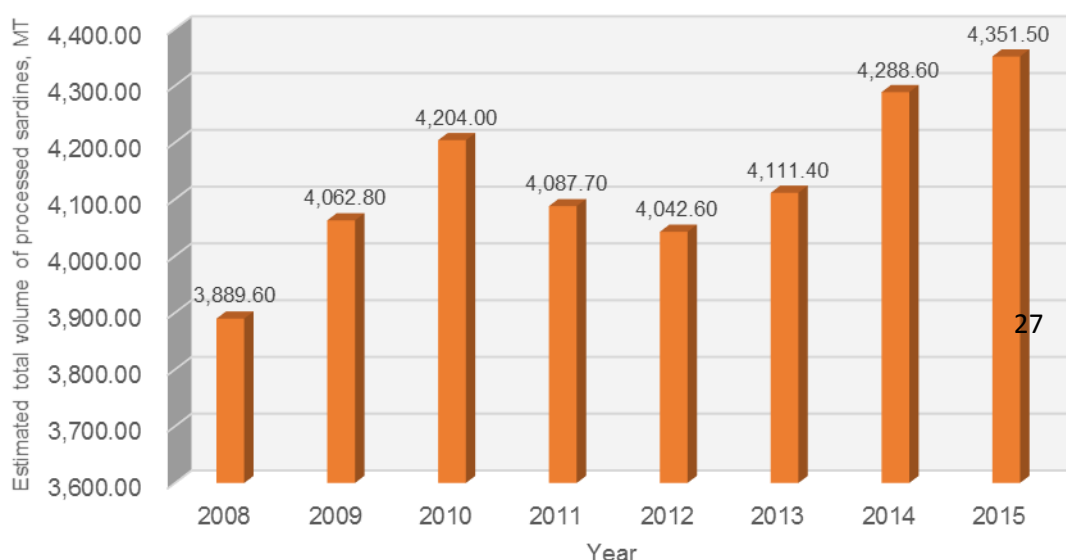


Figure 5. Volume of bottled sardine production in Zamboanga del Norte, 2015
 Source: Industry survey, 2015

Generally, production increased by 4% during the implementation of the closed fishing season policy (2012-2015) from the ‘no closed fishing season’ (2008-2010).

4.4.2 Value of Processed Sardines

Canned Sardines

The local sales volume trend of canned sardines generally showed fluctuating trend. From 2008 to 2011 sales gradually increased, declined slightly the following two years and then picked up in 2014 to 2015. The highest sales volume of canned sardines was recorded at 128,923.64 MT in the year 2011, which was also the year of the initial implementation of JAO-01. The high sales volume was accordingly the reaction of institutional buyers in anticipation of the 3 months JAO starting December 1, 2011 to March 1, 2012.

During the implementation of the closed fishing season, sales volume was 117,893.02 MT in 2012 slightly lower by 8.5% from 2011 and further declined in 2013 as a result of a decline in sardines catch in the commercial fishing sector. In 2012, there was an importation of fresh sardines at a volume of 2,371 MT which added to the volume of canned sardines produced. However, the importation in 2013 reduced to only 308MT coupled with the lowest catch for the entire period of the JAO at 100,483.54 MT. Canned sardines were produced and sold at the lowest in 2013. In 2014 to 2015, sales increased due to increase in sardines catch volume plus the importation of 329,760 kg in 2014.

Bottled Sardines

Data were not available for determining trends in values of bottled sardines.

4.4.3 Impacts on Number of Workers

While the closed fishing season undeniably allows for the recovery of the fishery resource as the closes season allows for the spawning of the sardine and allows the little ones to grow, it disrupts the operation of canneries as it cuts the steady supply of fresh fish. Not all players are able to store a sufficient volume of fish to be processed during the 3-month close season.

Canneries

The number of workers employed in the canneries increased during the implementation of closed fishing season (Figure). This indicates that the volume of work increased. This is due to the increase in fish catch plus the volume imported from 2012 to 2014.

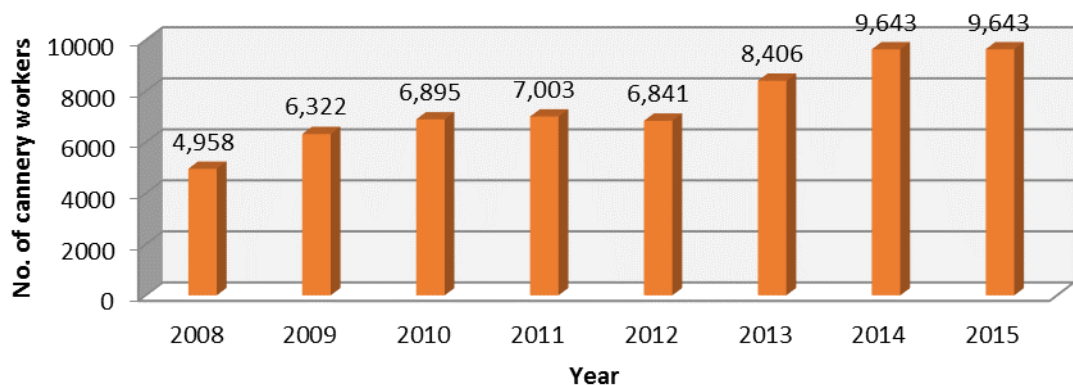


Figure 6. Total number of cannery workers in Zamboanga City, 2008-2015

Source: Department of Labor and Employment, 2015; Industry survey, 2015

Only 10 percent of cannery workers are retained to do maintenance work and accomplish year-end reports. The rest go home to their respective provinces, jobless for three months. Nonetheless, the commercial fishing sector makes use of the closed season as the time to check equipment and institute repair but retaining only five percent (5%) of their work force. Per interview with players from the fishing sector, it seems that their workers are quite happy about the three-month closed season as this will give them time to go on vacation and go home to their respective families in time for Christmas. This is in view of the fact that most of them stay at sea for straight 3 -6 months. Also, this will be the time to claim their accumulated incentives other than their monthly salary.

Bottlers

Similar to canneries, bottled sardines processors hired more workers during the closed fishing season as indicated in the graph in Figure 7. About 16 % were hired in 2011 to 2014 and this increase to 17% in 2015. The number of workers also depends on the volume of fish available for processing. In the bottled sardines, workers also increased by about 15 % during the closed fishing season (2012-2015) as

compared in 2008-2011. The increased is minimal because the processors are small to medium cottage industries and therefore producing lesser volume compare to canneries.

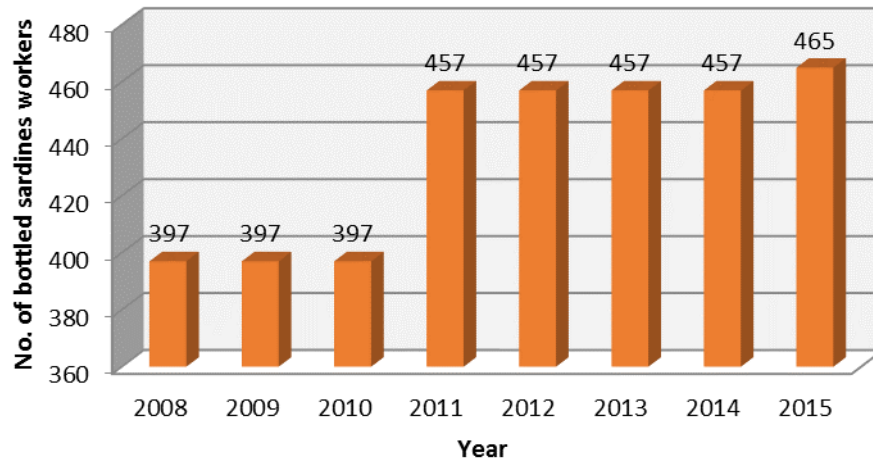


Figure 7. Total number of bottled sardines workers in Zamboanga del Norte
Source: Industry survey, 2015

4.4.4 Impacts on Incomes of Workers

The workers' main source of income comes from their employment in the sardines industry, ranging from 6 to 8 years. Some engage in 'habal-habal' driving as an alternative source of livelihood during the closed season. Few of the bottled sardines' workers have alternative sources of income.

Before closed fishing season, workers in the canneries earned an average of Php64,871 a year for working 11 months or a monthly income of Php5,897 (Figure 8). During closed fishing season, workers earned an average Php57,116 for working 9 months or a monthly income of Php6,346. Inasmuch as working in the canneries is the main source of income particularly the women, during the implementation of the closed fishing, income of workers reduced by about 12% for the two months they are out of work in the industry.

Workers in the bottled sardines earned lower income compared to canneries. They earned an average of Php45, 287 a year or Php5,032 a month. Other companies hire workers for 11 months even during closed season for sardines to process bangus, squid and other marine products. During the closed fishing season, worker earned lower income of Php43,488 a year, about 4 % less than the income before the closed season period.

Tin can workers during the first year of implementation were not psychologically and financially prepared to stay out of work. However, after two years, workers seem to accept the fact and are more prepared. There was need to save part of their salaries during the 9-month work to be able to meet the family needs

during the closed fishing season. Their average annual income is Php68,834 a year before the closed fishing season or a monthly income of Php6, 258. Their income during the closed season period is Php65,247 a year on the average for working 9 months.

The fishing crew has a higher income during the closed fishing season, from an average annual income of Php40,136 before to Php61,598 during the closed fishing season. This explains the increase in the volume of catch as fishing crew gets additional incentives from the actual catch aside from their minimum wage. They used their savings to engage in other enterprise during the 3- month period.

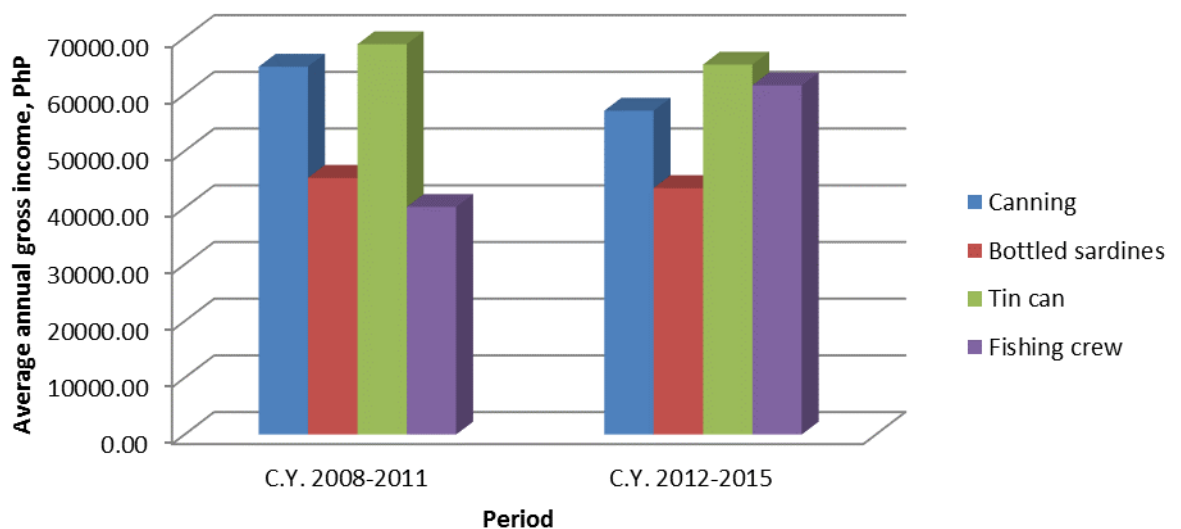


Figure 8. Average annual gross income of sardine industry and allied industry workers, by period

Source: Household survey, 2015

During key informant interviews, some changes were cited by top management of canneries in their operations as a consequence of closed fishing season from December 1 to March 1, of every year. Before the closed fishing season, canneries operate only for 11 months and one month break for Christmas as well as the general cleaning of facility and repair of equipment. During the implementation of JAO, canneries operate for 9 months a year. The following were cited:

- Companies invested in facility expansion to increase volume of production within the 9-month period to catch up with the volume requirement of the export and local markets for 12 months consumption. A notable increase of almost 50% of the average volume produced during closed season (2012-2015) when compared to the average production before the closed season (2008 to 2010) was observed.
- The average number of workers hired in the canneries increased by about 38 % during 2012 to 2015 when compared to the average number of workers from 2008 to 2011(Jan- Nov).

- Canneries have to rent storage facilities outside the production plant because of the increase in production. This implies additional cost to the company for storage, inventory and carrying cost for two months estimated at 15 % of the cost per unit of the product.

4.5 Policy Impact: Changes in household incomes and employment of fishers and factory workers

4.5.1 Factory Workers

Duration of work and income during closed season

At the household level, the effect of the closed season on workers in canneries and bottling plants is mainly on their livelihoods. , Only 42% of worker respondents have an income source during the closed fishing season to compensate for the lost income Livelihoods during the closed fishing season include working as hired labor (e.g., construction worker, laborer, driver, *labandera*, house helper), employment in other industry (e.g., sales lady/boy, gasoline boy, security guard), and engaging in own business (e.g. sari-sari store, tricycle).

Only 20% of workers continued working in the sardine factory. A similar fraction of workers also turned into vendors of various products such as fish, dried goods, food and even venture in buy and sell. Others worked as drivers, laborers, makers of nipa roof, net and bamboo furniture. Some of the workers also worked as delivery boy, gasoline boy and sales attendant, barber, caregiver and security guard. Some have work related to fisheries such as boatman and fishing. Other jobs include domestic worker such as maid, cook or laundry service.

For majority of the workers, work during the closed fishing season lasted from three to four months, consistent with the length of the closed season. In Zamboanga City, the cannery workers earned an average of Php12,276 in three months (or Php4,094 per month) while bottling workers in Zamboanga del Norte workers earned Php21,324 for the same time period (Php7,108 per month) or an average monthly wage of Php5,600 per month for three months for both types of worker.

Lost income estimate

Loss of income due to the closed fishing season was expected because of the stoppage in operation of sardine factories. Two means of estimating lost income is presented. The first one used the number of months without work in canneries and average monthly income reported in the survey. The second is based on the number of work days and overtime work on the year before and during the closed fishing season is considered. The information used in the first is from the household survey and the second from the stakeholders meeting.

Reduced number of work months

To estimate the lost income closed fishing season, the number of months the workers were employed the previous year was asked in the household survey. It is then compared to an 11-month operation of sardine canneries (one month is devoted to maintenance of facilities hence no sardine processing operation).

The results show that the number of work months reported varies but more than half of the worker respondents reported working for eight to nine months which is consistent with the three-month closed fishing season. The pattern is more pronounced in Zamboanga City where 61% said they worked only for eight to nine months in the past year compared to Zamboanga del Norte at 54%. Only 22.8% in Zamboanga City and 19.7% in Zamboanga del Norte reported working the full 12 months the past year.

The difference between the two locations can be attributed to the diverse products being produced by the processors. As explained by industry players, sardine processors in Zamboanga City are highly specialized (i.e., machines are designed only for sardines) so they are forced to halt their production when supply of raw sardines stops. Processors in Zamboanga del Norte, which are generally considered as household/backyard industry, can still process other fish species (e.g., bangus or milk fish) if supply of sardines is affected by the policy.

Assuming those who worked for at least eight months (n=108) are the ones who lost employment due to the closed fishing season, the total lost income the past year is estimated at Php1.764 million or an average of Php16,335 per worker. Comparing the two locations, workers from Zamboanga City lost an estimated Php1.119 million (average of Php13,332 per worker) and Php0.645 million in Zamboanga del Norte (average of Php10, 240 per worker).

Based on 6,000 direct workforce (DOLE Region IX, 2014) in Zamboanga City with the assumption that workers will work for 11 months without the closed fishing season policy, the total estimated lost income of workers is around Php74.605 million annually.

Increase in work days and working hours during open season

Consultation with industry players revealed changes in number of working days and work hours as result of the closed fishing season which was not uncovered in the household survey. The changes include increase in number of work days in a month from around 20 due to uncertain fish catch volume in the years prior to closed fishing season to a maximum of 28 days today. In addition, canneries sometimes require paid overtime work in months of high volume fish catch such as April and May to cope with the volume of fish catch and in November to produce the volume of canned sardines required to supply the market during the closed season. The increase in number of work days and work hours offsets part of the income lost during the closed fishing season.

The annual income received in the years before the policy implementation is only slightly higher than when the policy was implemented, Php64,260 to Php62,730 (decrease of Php1,530). Annual income from the basic pay is still higher before the policy (Php64,260 to Php51,255) but the additional overtime pay amounting to Php11,475 when the closed fishing season policy was implemented offsets much of the income difference.

Table 2. Annual income before and during closed fishing season policy.

Assumptions	Year before closed fishing season	During closed fishing season	Increase (Decrease)
Number of work months	9	11	(2)
Average no. of working days per month	21	24	3
No. of months with overtime work / overtime hours per shift	None	April, May, November / 3hours	3
Wage rate ²	255	255	-
Income from basic pay	64,260	51,255	(13,005)
Average per month	5,355	6,970	1,615
Income from OT	0	11,475	11,475
Annual Income	64,260	62,730	(1,530)

4.5.2 Municipal Fishers

Unlike the workers, municipal fisherfolks are less affected by the closed fishing season as majority of them continue fishing even during the banned period. Officially, municipal fishing is not included in the policy, but some local governments tried to also apply the policy to the municipal fishers.

Only 21 of the interviewed fisherfolks reported catching sardines, where proportion of sardines to total catch is low. Sardines command a very low selling price of just about Php14 per kilo on the average. However, what sardine species lack in frequency and low market price, it makes up by the volume of the catch. The average catch of the fisherfolk respondents from their recent fishing trip is 189 kgs valued at Php5,638. Those with mixed catch reported the highest average total catch at 1,091 kgs valued at Php25,436. Those who caught non-sardines only have the lowest average catch volume (48 kgs) and value (Php4,136). Those who caught sardines only averaged 629 kgs with a value of Php5,223 (Table 3).

Table 3. Average volume (and value) of the recent fish catch of municipal fisherfolks by composition and type of fish catch.

Composition of the respondent's catch	Type of fish		Total
	Non-sardines	Sardine	
Sardines only (n=16)	-	629 (5,223)	629 (5,223)
Non-sardines only (n=101)	48 (4,136)	-	48 (4,136)
Mixed catch (n=8)	738 (21,251)	353 (4,184)	1,091 (25,436)

² Based on DOLE Wage Order RIX No. 15 (2010). Although the wage rate during the implementation of the closed fishing season policy, the rate in 2010 was used in the computation to remove the impact not attributed to the policy.

Composition of the respondent's catch	Type of fish		Total
	Non-sardines	Sardine	
ALL	86 (4,702)	103 (936)	189 (5,638)

Source: Household Survey in Zamboanga City and Zamboanga del Norte, 2 to 19 June 2015

Coping mechanisms against policy-induced income and livelihood shock is very low even among workers who suffer from work stoppage as opposed to fisherfolks most of whom continued with their fishing even during the closed season. This can also attributed to worker households' multiple income sources that serve as shock absorber until such time production in sardine processing companies resumes.

4.5.3 Commercial Fishers

Only six respondents (one in Zamboanga City and five in Zamboanga del Norte) are classified as commercial fisherman based on the respondents' estimate of their boat's gross tonnage. In addition, these boats can be considered as small-scale commercial vessels as estimated gross tonnage barely exceed the 3-ton lower limit.

Household income sources

Five of the six fisherfolk households involved in commercial fishing have multiple types of income sources. In this case, the single income source household registered a higher income than multiple-income source households. However, due to a very small sample size for commercial fisherfolks, it is difficult to deduce on the average income of the households.

The income source of commercial fisherfolk households is not as diverse as the municipal fishers. As shown in Table 4, none of the households earned income from working in sardine processing plants. Two-thirds of the household earned income from fishing and related activities while the rest is from non-fishing activities.

Table 4. Average annual income of commercial fishing households by location and income source type.

Location	Fishing and related activities income	Sardine processing income	Non-fish income	TOTAL INCOME	No. of income earners
Zamboanga City	0	0	84,000	84,000	2
Zamboanga del Norte	88,400	0	28,600	117,000	2
Grand Total	73,667	0	37,833	111,500	2

Source: Household Survey in Zamboanga City and Zamboanga del Norte, 2 to 19 June 2015

Catch volume and general catch composition

Disaggregating the catch of commercial fisherfolks into sardine and non-sardines can provide a rough assessment of the potential income loss on the fisherfolk

due to the sardine fishing ban. On the average, commercial fishing vessels reported a much higher volume of total catch in their recent trip – 1,091 kgs (Table5). The volume of sardines (600kgs) is higher than non-sardines (491 kgs) but the latter has a higher value.

Table 5. Average volume (and value) of the recent fish catch of commercial fishing vessels by composition and type of fish catch.

Respondents	Commercial		
	Non-sardines	Sardine	Total
Sardines only	-	2,000 (15,000)	2,000 (15,000)
Non-sardines only	18 (1,410)	-	18 (1,410)
Mixed catch	2,400 (120,000)	1,000 (10,000)	3,400 (130,000)
ALL	491 (24,846)	600 (5,000)	1,091 (29,846)

Source: Household Survey in Zamboanga City and Zamboanga del Norte, 2 to 19 June 2015

For those who had mixed catch, the volume of non-sardine fish is higher than sardine fish catch. Considering the selling price of the fish, there is seeming preference for non-sardine fish especially for commercial fishing vessels.

4.5.4 Coping Mechanisms of Households and Capacity building and assistance received

The respondents reported active forms of coping including seeking other forms of employment as hired labor, engaging in small business, driving for local transportation, and engaging in fishing activities. Maintaining a tighter household budget is the only passive coping mechanism reported but only by workers. Capacity building activities can assist households cope with the loss of income. The reported trainings, on good manufacturing practices and fish processing, could help affected worker households respond to the closed fishing season policy.

4.5.5 Perception on Income Change

Forty four percent (44%) of all the respondents perceived a decrease their income compared to the period before the closed season policy. But there is a contrasting perception about the income for the fishers and fisheries workers. More than half of the fishers said their income is at least the same or higher today compared to five years ago. However, in the case of the workers, there is a clear perception that their income today is lower or much lower (combined 53.5%) than five years ago.

This perception on income change supports the earlier discussion on the effect of the closed fishing season on the livelihood. As previously mentioned, workers experience regular work stoppage of three months on the average resulting in reduced annual income. Meanwhile, municipal fishers continued their fishing activities which minimized the income loss.

4.6 Social welfare impacts of the closed season policy

Social benefit cost analysis was done and the benefit cost ratio was computed using 2015 prices. The benefits accrue to the increase in annual value of fish catch by municipal fishers, increase from annual income due to alternative livelihood of workers, increase in incomes of the fishery crew and increase in income of the cannery workers as a result of additional employment and/or overtime work. The costs were from reduction in the value of landed catch by commercial fishers, reduction in income of workers in canneries and bottling plants and increase in regulatory costs by government. The results show some income distribution effects as incomes of municipal fishers increased as revealed by the increase in value of landed catch, mostly due to higher catch of other high valued species. There were also higher employment in the canneries as a result of the intensive operation due to high catch during the closed season.

The results reveal that the benefit cost ratio is 2.4 (Table 6). In economic terms, the benefits outweigh the cost. Effects in the other agribusiness activities such as the increase in demand for tin cans, increase in demand for tomatoes for sardines and other such benefits were not included for lack of data. In addition, data on additional investments in storage facilities as a result of intensive processing activities in the open season were also unavailable. As well, while data are not available, in ecological terms, there may be increases in fish stock as revealed also by the increase in landed catch. Counterfactual wise, if no policy was imposed, then there may be societal losses from the ecological perspective. Therefore, at the society level, the closed season policy has increased social welfare.

Table 6. Social benefit cost analysis of the closed fishing season policy, Zamboanga Peninsula (2015=100).

ITEM	Before	After	Incremental Benefits/Costs
	Php	Php	Php
Social Benefits			
Increase in the value of landed catch of municipal fishing ^a	1,409,000	12,323,000	10,914,000
Increase in Annual Average HH Income from Alternative Livelihood ^b	0	40,320,000	40,320,000
Increase in Annual Aggregate Gross Income from Additional Employment in Canning Factories ^d	0	154,263,668	154,263,668

Total	289,274,360	587,278,948	298,004,588
Social Costs			
Reduction in the value of landed catch of commercial fishing ^a	72,858,000	63,324,000	9,534,000
Annual Average Cost of DA-DILG AO No. 1 ^c	27,010,417	27,500,000	489,593
Aggregate Income lost by workers in bottled sardines industry during the closed fishing season ^f	21,678,296	18,059,792	3,618,504
Aggregate Income lost by workers in canning factory during the closed fishing season ^g	467,619,180	355,993,080	111,626,100
Total	589,165,893	464,876,872	125,268,187
SOCIAL BENEFIT COST RATIO (SBCR)			2.38

^a The average annual fish catch value that was estimated based on Philippine Statistical Authority data.

^b Based on household survey, average income from other sources during the closed season months (3 months) is estimated at PhP 5600 per month for 40% of a total of 6000 factory workers.

^c The average annual income of fishery crew was estimated at PhP 40,136 before the close season policy and has increased to PhP 61,598 and was aggregated based on a total of 6000 crew. Data were based on industry survey.

^d The average annual value of increase in incomes from cannery estimated at PhP 57,116 multiplied by 2,600 additional employees.

^e This was based on increase in regulatory costs of government.

^f The average annual value of income lost by bottled sardines workers was estimated as the difference of before (PhP 45,287) and during (PhP 43,488) the closed fishing season for 400 workers

^g The average annual value of income lost by cannery workers was estimated as the difference of before (PhP 64,870) and during (PhP 57,116) the closed fishing season for 6000 workers.

V. Conclusions and Recommendations

During the first year of the implementation of the fishing closure, the limited consultations with the stakeholders on the ground - the fisherfolk and workers, and some LGUs have contributed to the misunderstanding and resistance among local enforcers and community stakeholders.

The key factor for successful implementation of the closed fishing season is the availability of resources (i.e., funds, assets and personnel) allocated solely for enforcement; and the fervent support coming from the backbone of the sardines industry.

The landed catch trend is increasing, the high value species caught also increased. The volume of sales for both bottling and cannery was not affected by the policy; and has generally increased. Factory employment declined during the months of December to February, but increased overtime work was needed for the more intensive operation during the open season. This has increased incomes and also increased employment. Factory workers had found alternative livelihoods during the closed season thus, the slight increases in household incomes from alternative sources as well. In economic terms, there is positive effect due to the policy. Counterfactual wise, if no policy was imposed, then there may be societal losses from the ecological perspective.

There are many challenges (technical, institutional) related to generation of data (e.g., biological, physical, ecological) to assess impact of the policy.

Recommendations offered by the study include the following:

- 1) Building on past efforts and coordinating with other institutions working on fisheries research, standard monitoring methods may be developed to support informed decision making. Community-based fish catch monitoring may also be enhanced through building interest and capacity (e.g., record keeping, data collection techniques).
- 2) It is important to continue biological study including spawning period of sardines as this may be affected by changing climatic conditions and ecological conditions of a water body.
- 3) Additional investment for cannery facilities is recommended to match the increase in volume of catch as a result of the closed fishing season. Likewise, export market prospects for sardine products should be further explored, such as food quality standards (sardines threshold for heavy metals) imposed by the international market.
- 4) Government must continue to provide work options during closed season to augment income of affected workers. The provisions of assistance to affected workers were limited such as sewing machines and labor for fishers affected in rehabilitating the mangroves
- 5) It is suggested to study other regulatory measures that should complement the closed season policy such as establishment of fish sanctuaries and strategies to reduce post-harvest losses.

VI. Literature Cited

- Adan, W. R. (2009). Fisheries Policies and Management in Panguil Bay, *1*(1), 32–42.
- Ahmed, M., Salayo, N. D., Viswanathan, K. K., Garces, L. R., & Pido, M. D. (2006). Management of Fishing Capacity and Resource Use Conflicts in Southeast Asia : A Policy Brief, (August).
- Attrill, M., Austen, M., Cousens, S., Gall, S., Hattam, C., Mangi, S., ... Stevens, T. (2012). *Lyme Bay – a case-study: measuring recovery of benthic species; assessing potential “spillover” effects and socio-economic changes, three years after the closure. Report 1: Response of the benthos to the zoned exclusion of bottom towed fishing gear in Lym.* Plymouth. Retrieved from http://randd.defra.gov.uk/Document.aspx?Document=11170_MB0101BiodiversityReport2012_FINAL_Apr2013.pdf.
- Barley Kincaid, K., & Rose, G. (2014). Why fishers want a closed area in their fishing grounds: Exploring perceptions and attitudes to sustainable fisheries and conservation 10 years post closure in Labrador, Canada. *Marine Policy*, *46*, 84–90. <http://doi.org/10.1016/j.marpol.2014.01.007>
- Bennett, N. J., & Dearden, P. (2014a). From measuring outcomes to providing inputs: Governance, management, and local development for more effective marine protected areas. *Marine Policy*, *50*(PA), 96–110. <http://doi.org/10.1016/j.marpol.2014.05.005>
- Bennett, N. J., & Dearden, P. (2014b). Why local people do not support conservation: Community perceptions of marine protected area livelihood impacts, governance and management in Thailand. *Marine Policy*, *44*, 107–116. <http://doi.org/10.1016/j.marpol.2013.08.017>
- Brillo, B. B. C., Elazegui, D. D., Cervantes, C.P. and. Rola, A.C. (2016). Assessing the Formulation and Implementation of the Closed Fishing Season Policy for Sardines in Zamboanga Peninsula , Philippines. *Philippine Journal of Science*, *145*(4), 395–404.
- Cohen, P. J., Cinner, J. E., & Foale, S. (2013). Fishing dynamics associated with periodically harvested marine closures. *Global Environmental Change*, *23*(6), 1702–1713. <http://doi.org/10.1016/j.gloenvcha.2013.08.010>
- DOLE Region IX. (2014). ADVISORY NO. RIX-01: Advisory on the Implementation of Productivity-Based Incentives Schemes for the Sardines Canning Industry in the Zamboanga Peninsula Region. Zambianga City. <http://doi.org/10.1017/CBO9781107415324.004>
- Dunn, W. N. (2004). *Public policy analysis: an introduction* (3rd ed.). New Jersey.

- Failler, P., & Pan, H. (2007). Global value, full value and societal costs: capturing the true cost of destroying marine ecosystems. *Social Science Information*, 46(1), 109–134. <http://doi.org/10.1177/0539018407073660>
- FAO. (2013). FAO Globefish Reports - Small Pelagic - June 2013. Retrieved from <http://www.thefishsite.com/reports/?id=2257>
- Fernandez, P. R. J. (2006). The Relevance of Governance Institutions in Marine Protected Area Design and Management : Lessons from Northeastern Iloilo , Philippines. *Science Diliman*, 18(1), 18–34.
- Jalotjot, H.C. and C.P.Cervantes. 2016. *Income and Livelihood Impacts of Closed Season Policy of Sardines, Zamboanga Peninsula, Philippines* CSPPS Working Paper Number 2016-10, College of Public Affairs and Development, UP Los Banos, College, Laguna, Philippines.
- JAO Administrative Order No. 1, Series 2011.
- Mardle, S., Pascoe, S., & Herrero, I. (2004). Management Objective Importance in Fisheries: An Evaluation Using the Analytic Hierarchy Process (AHP). *Environmental Management*, 33(1), 1–11. <http://doi.org/10.1007/s00267-003-3070-y>
- Naguit, M.R.A. 2016. *Impact of Closed Season Policy of Sardines on Landed Catch, Zamboanga Peninsula, Philippines*, CSPPS Working Paper Number 2016-11, College of Public Affairs and Development, UP Los Banos, College, Laguna, Philippines.
- Narvaez, T. A., Cornelio, N. 2016. *Industry Level Impact of Closed Season Policy of Sardines, Zamboanga Peninsula, Philippines*, CSPPS Working Paper Number 2016-12, College of Public Affairs and Development, UP Los Banos, College, Laguna, Philippines.
- Olsen, E., Aanes, S., Mehl, S., Holst, J. C., Aglen, A., & Gjosaeter, H. (2010). Cod, haddock, saithe, herring, and capelin in the Barents Sea and adjacent waters: a review of the biological value of the area. *ICES Journal of Marine Science*, 67(1), 87–101. <http://doi.org/10.1093/icesjms/fsp229>
- Paunlagui, M. M. (2016). *Knowledge, Attitude, and Perception of Fishers and Sardine Factory Workers*. CSPPS Working paper No. 2016-08, College of Public Affairs and Development ,UP Los Banos, College, Laguna, Philippines.
- Piloton, R. D., Felix, L. R., & Campos, W. L. (2015). *Implications of ichthyoplankton abundance patterns and ontogenetic distribution of clupeid larvae off the coast of Zamboanga Peninsula*. Retrieved from <http://citeweb.info/20151956849>

Rola, A. C., Narvaez, T. A., Naguit, M. R. A., Jalotjot, H. C., & Cervantes, C. A. (2017). *Social Benefit Cost Analysis of the Closed Season Policy of Sardines, Zamboanga Peninsula, Philippines* CSPPS Working paper No. 2017-01, College of Public Affairs and Development ,UP Los Banos, College, Laguna, Philippines.

Sanchirico, J. N. (2000). *Marine Protected Areas as Fishery Policy: A Discussion of Potential Costs and Benefits* (No. Discussion Paper 00-23). Washington D.C. Retrieved from <http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-00-23-REV.pdf>