

Original paper

## AN ASSESSMENT ON FISHERS' COMPLIANCE BEHAVIOR IN PEMALANG REGENCY, CENTRAL JAVA - INDONESIA<sup>1</sup>

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### ABSTRACT

*The study was conducted due to high incidence of non-compliance by fishers in Central Java fisheries. The overall objective of the study is to examine the compliance behavior of fishers in Pemalang Regency. Eighty-five (n=85) respondents have been selected from the study areas using multi-stages sampling method. Moreover, key-persons from Fisheries Office, Navy and head of fishers' association have also been interviewed to enrich the analysis of the study. Non-compliance behaviour of fishers in this study was viewed from violation of: restricted area (zoning), restricted gears and means (explosive and poison) and administration (such as permits). Model of non-compliance behavior as outlined by Kuperan (1993) and Susilowati (1998) has been applied to analyze the data in this study with necessary modification. Tobit model explained by Gujarati (2003) was employed as the estimation techniques.*

*Most of independent variables such as demographical factors, fishing effort, deterrence indicators and legitimacy variables have expected signs although statistically are not always significant. In general, the model of non-compliance behaviour could portrait the phenomena of violation behaviour of fishers in the study area. It is realized that law enforcement in Indonesian fisheries is weak for several reasons. Therefore, to improve the fishers' compliance perhaps an alternative approach such as empowering the people and its stakeholders should be found.*

**Key words:** Fishers, Compliance, Pemalang, Model, Enforcement, Co-Management.

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### INTRODUCTION

Marine fisheries in Indonesia are almost exclusively small-scale fisheries. To protect the small-scale fishers from unfair competition with large-scale operators, the government introduced several regulations

to manage the Indonesian fisheries. The first evidence of official concern came in 1973 when the Minister of Agriculture issued decree 561 calling for the "rational" exploitation of fisheries resources. Subsequently, in 1974, the Minister of Agriculture issued Decree No. 40, which

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stated that trawler by catch device must be fully utilized rather than cast overboard. In 1976, the authority expanded the regulatory measures by issuing Ministerial Decree No. 607 to establish a series of parallel coastal zones commencing 3 miles, 4 miles, and 5 miles from the shore line and its subsequent layer to the shore. This regulation then was amended by Decree No.392/Kpts/LK.120/4/99. The rationale for imposing these zones strongly suggested that the Decree was issued as a means of controlling large-scale gears operation. The main purpose of the zoning regulation among others is for resource conservation and protection of the small-scale fishers. The zoning regulation is expected to ensure the sustainability of inshore waters environment which serve as breeding and nursery grounds for fish.

The implementation of these regulations inevitably requires an effective enforcement and controlling mechanism. In fact, enforcement in Indonesia and particularly for the fisheries of Central Java is weak in operation. This could adverse the voluntarily compliance of fishers in the region. Many incidences of non-compliance by fishers were found in Indonesia including in the Java Sea (Susilowati, 1998).

## **PROBLEMS**

The non-compliance behavior could be explained by tight competition among the resource users in harvesting the saturated fisheries in Indonesia (Forum, 1996 and Gatra, 1996), particularly nearby Java Island. Lack of institutional effectiveness, social pressure and moral degradation are worsen due to the down turn of economic and political situation in Indonesia. Securing compliance with regulations is a much more difficult task. Fishers may also be driven to violate due to multi-dimensional motives and such a contextual situation they are in. It should be noted that

compliance is necessary for successful management of the fisheries. But to secure compliance need enforcement and surveillance which is quite costly (Sutinen, 1987 and 1996).

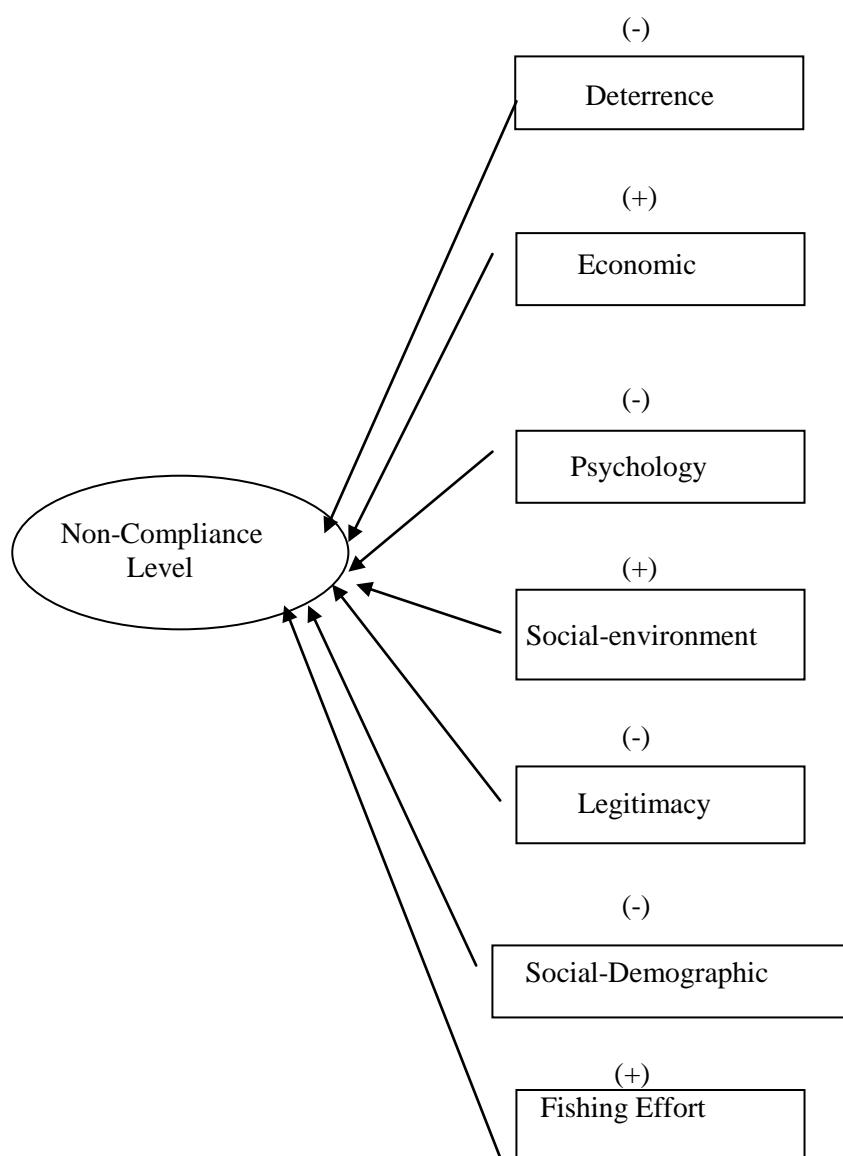
Given such background, the research problem is how to secure compliance with limited enforcement resources like Indonesia with special reference to Pemalang, Central Java fisheries. Thereafter, several research questions need to be answered by the study are: (1) How is the voluntarily compliance behavior of fishers in the study area?; (2) How can the violation behavior of the fishers be effectively modeled?; (3) What policy recommendations should be offered to improve compliance level of the fishers?. Unfortunately, very little research has been done to explore non-compliance behavior of fishers in Asia and Africa. The only studies conducted in Asia are by Kuperan (1993) and Susilowati (1998). Therefore, it is timely to conduct the study on intensity of compliance behavior of fishers in Pemalang Regency.

## **MATERIALS AND METHOD**

In general, the study is aimed to examine the compliance behavior of fishers in Pemalang Regency, Central Java-Indonesia. While, the specific objectives are as follows:

- (1) To describe the profiles of respondents in the study area,
- (2) To develop a model of voluntarily non-compliance behavior of fishers in the study area;
- (3) To examine factors affecting non-compliance behavior of the fishers in the study areas,
- (4) To provide policy recommendations for improving compliance behavior of fishers in the study area.

The theoretical framework of the study is depicted in Figure 1.



**Fig. 1.** The Theoretical Framework

The respondents were withdrawn with multi-stages sampling method and the sample distribution is summarized as follows.

**Table 1.** Sample Distribution<sup>1/</sup>

Scale <sup>2/</sup>	Sample (n)
Small-scale	39 persons
Large-scale	46 persons
Total	85 persons

Note:

1/ Location: Pemalang, Central Java (West coast of Central Java Province).

2/ Classification of fisheries scale is based on the discussion with the Fisheries Officer. Small-scale if  $HP \leq 20$  and large-scale if  $HP > 20$ .

The model of non-compliance behavior as outlined by Kuperan (1993) and Susilowati (1998) has been applied to analyze the data in this study with

necessary modification. Tobit model as defined by Gujarati (2003) has been employed as the estimation technique in the study and is formulated as follows.

NONCOMP = f (Deterrence, Econ, Psycho, Pertviol, Legitimacy, Fishing Effort, Demographical Factors). Definition of the operational variables is shown in Table 2.

**Table 2.** Definition and Measurement of the Operational Variables

Variable	Code	Definition	Measurement
<b>Dependent Variable</b>			
Non-Compliance	NONCOMP	Non-compliance decision of fishers to fish either in prohibited zone, using restricted gear and/or means, lack of administration conditions.	- Intensity = frequency of violation for the respective restrictions or rules
<b>Independent Variables</b>			
Age	AGE *)	Age of respondent.	In numerical value (years)
Numbers of family members	TFAM *)	Numbers of family members under the responsibility of respondent.	In numerical value (persons)
Work experience	LONG *)	The length of respondents' work experience being a fisher.	In numerical value (years)
Horse power	HP	Capacity of boat engine as a proxy of fishing effort.	In numerical value (HP)
Deterrence	DDETECT DREMIND DREPORT DOBSERV DCAUGHT	Detection and conviction as a proxy of enforcement availability. DDETECT, DREMIND, DREPORT, DOBSERV, DCAUGHT are chance for being detected, reminded, reported, observed and caught, respectively.	In Likert scale <sup>1/</sup> (MI)
Economic opportunity	SEAKG	Economic opportunity or values earned by fisher from violating the observed regulation.	In numerical value (kg)
Moral development	PSYCHO	Psychological indicators of the moral development of individual fisher.	In Likert scale <sup>1/</sup> (MI)
Social-environment	PERTVIOL	Social environment influences towards the violation of individual fisher.	In numerical value (%)
Legitimacy <sup>2/</sup>	LEGITIM	Outcome and process variables represent legitimacy accorded by the individual fisher to the rule or regulations or legal authorities. The variables used by Kuperan (1993) and Susilowati (1998) are adopted with modification and enhancement.	In Conventional scale (1 to 10) <sup>3/</sup> (MI)

Notes:

1/ It has been consulted with the competent panels such as religion and community leaders.

2/ Detail component of the legitimacy variables was determined after pre-survey.

3/ It is explored with in-depth interview.

MI: it is measured from several items.

In Indonesia, conventional scale (1 to 10) is more widely used by people as evaluation scale measurement.

\*) Demographical factors.

The rational choice theory as argued by Becker (1968) could influence the decision made by the individual fisher. The propensity of individual fisher to engage in non-compliance activities (such as violate the rules or regulation or restrictions) may be guided by the ratio between benefit and its cost. Whenever the benefit is greater than its cost, a person will tend to engage with such activities although in illegal ways. The intensity of violation committed by individual fisher is usually estimated by Tobit model. This model is also known as a censored regression model. Some authors called such model with a Limited Dependent Variable (LIMDEP) model because of the restriction to put on the value taken by the regressand (Gujarati, 2003; and McFadden, 1973)

## RESULTS AND DISCUSSION

### Profiles of Respondents

Many respondents (76.5 percent) are young fishers with age between 21 to 40 years old and the age average of 31 years. Most of them hold elementary school (89.4 percent) with work experience in fisheries sector for about 15.6 years. The average boat tonnage used is about 12 GT, employing engine power of 68.7 HP (in average) with about 7 crew members per boat.

The types of gear operated are mostly *cantrang* (seiners) and *kantong* (bag net) but many other gears are also used by fishers for rotation purposes. The details of socio-economic respondents' profile is shown in Appendix 1.

### Model of Violation Behavior

The non-compliance evidence from zoning regulation in the fisheries of Indonesia is relatively high (Susilowati, 1998). The condition is adverse due to the downturn economic situation like nowadays. The statistics of violation intensity committed by respondents in this study is shown in Table 4. The average numbers of violation frequency engaged by respondents is about 71 times in the last six months. Most respondents violated the regulations about 1 to 100 times in the last six months.

**Table 3.** Intensity of Violation <sup>1/</sup> Respondents in the Last Six Months

Description (times)	Frequency	Percentage	Cum. %
1 - 50	22	25.9	40.7
51 - 100	26	30.6	88.9
101 - 150	3	3.5	94.4
151 - 200	2	2.4	98.1
201 - 250	1	1.2	100.0
Sub total	54	63.5	
No reply	31	36.5	
Total	85	100.0	
Average		71	

<sup>1/</sup> Violations are either on gears, zoning, means used, and permits.

Source: Primary data, processed.

Tobit model is used to estimate the intensity of violation engaged by fishers. There are three scenarios of estimation outlined in the study as shown in Table 4, namely:

- Scenario #1: Economic model
- Scenario #2: Economic and Psycho model
- Scenario #3: Economic, Psycho and Social model

All variables in the model show its consistency in the signs in all scenarios. None of demographic variables (Age, number of family members and length of work experience) are significant, however the magnitude of its signs remain able to explain the empirical phenomena. It seems more mature in age, fishers tend to be more conservative for not engaging with illegal activities such as violation.

Fishers who have more family members also tend to behave least in non-compliance activities. This situation is reflected by the positive sign of variable TFAM. Respondents look more careful in working, perhaps in order to maintain their reputation, although actually respondents are potentially able to engage with violation activities given more work experience. This trend is in line with the positive sign of variable LONG.

The most important factor which determines the intensity of violation committed by fishers in the study area is fishing effort, hence it was proxied by horse power (HP) variable. The HP variable is statistically significant at

alpha=1% in all scenarios. This implies that higher use in horse power capacity will push fishers to commit violation.

The deterrence indicators such as chance to be detected, observed and caught by the enforcement officers have an expected sign (negative) although statistically remain not significant. Perhaps fishers will hesitate to do illegal activities whenever their activities are detected, observed and in worse caught by enforcement fleets.

Economic factor (proxied by catch gained by fisher) showed unexpected in sign. Normally, a good catch will motivate fishers to engage more violation but in fact, fishers in the study area are not to do so. In some extents, violation maybe can not be viewed only from economic motive rather than from many dimensional motives came together.

The variables of psychology which represent the moral development (Kohlberg, 1981 and 1984) of fisher and the variable of social-environment influence (PERTVIOL) in all scenarios have unexpected sign and are not significant at all. This can be interpreted that these variables failed to guide fisher in determining the violation intensity. Nevertheless, the magnitude of violation intensity is compensated by the expected sign of the legitimacy variable (i.e. negative) although it is not significant. It is believed that when a fisher is granted a higher legitimacy, it is a good start to direct them for better achievement of compliance level.

**Table 4.** Tobit Estimation of Violation Intensity of Fishers in Pemalang Regency

Variable	<i>ECON:</i> Coefficient (t-ratio)	<i>ECON+PSY:</i> Coefficient (t-ratio)	<i>EC+PSY+SOC:</i> Coefficient (t-ratio)
AGE 1/	-0.26496 (-0.22623)	-0.20723 (-0.17361)	-0.27294 (-0.23270)
TFAM 1/	-6.0908 (-1.1999)	-6.2383 (-1.2203)	-5.9905 (-1.1927)
LONG 1/	0.82042	0.77264	0.47933

Variable	<i>ECON:</i> Coefficient (t-ratio)	<i>ECON+PSY:</i> Coefficient (t-ratio)	<i>EC+PSY+SOC:</i> Coefficient (t-ratio)
	(0.69945)	(0.65072)	(0.40687)
HP	0.54236 (3.0991****)	0.54563 (3.1078****)	0.45265 (2.3468***)
DDETECT 2/	-6.9524 (-0.27635)	-7.6585 (-0.30277)	13.090 (-0.51346)
DREMIND 2/	22.048 (0.97887)	24.148 (1.0013)	23.619 (0.99563)
DREPORT 2/	45.945 (1.2458)	44.270 (1.1830)	43.871 (1.1847)
DOBSERV 2/	-1.8419 (-0.043187)	-2.2660 (-0.053153)	-5.8293 (-0.13869)
DCAUGHT 2/	-77.891 (-1.1119)	-74.653 (-1.0496)	-63.669 (-0.90421)
SEAKG 3/	-0.039812 (-3.7552#)	-0.040062 (-3.7549#)	-0.039686 (-3.8081#)
PSYCHO		0.69186 (0.24481)	0.86323 (0.30991)
PERTVIOL			-430.90 (-0.000063)
LEGITIM			-0.59546 (-0.70249)
CONSTANT	38.447 (1.2919)	11.212 (0.097524)	488.74 (0.000071)
FREQ	(9.7927****)	(9.7859****)	(9.7980****)
Log-likelihood function	-311.59276	-311.56280	-310.06873

Note: Dependent variable: FREQ

1/ Demographical factors; 2/ Deterrence factors; 3/ Economic factor

\*\*\*\* : significant at 1% level.

\* : significant at 10% level

\*\*\* : significant at 2% level

# : significant but incorrect sign

\*\* : significant at 5% level

### ***Solutions for Compliance Improvement***

Respondents in Pemalang have high propensity for being non-comply (see Table 3). More or less fishers in the study

area have non-compliance rate over than 70 percent as agreed by 40 percent of respondents in Pemalang. The figures for non-compliance of other fishers as perceived by respondents is shown in Table 5.

**Table 5.** Percentage of Non-Compliance of Other Fishers as Perceived by Respondents

Description (%)	Frequency	Percentage
≤ 50	30	35.3
51 - 70	16	18.8
71 - 100	34	40.0
Sub total	80	94.1
No reply	5	5.9
Total	85	100.0
Averaged	62.8	

Source: Primary data, processed.

In this study, respondents were asked why they intended to violate the regulations and their reasons are listed in the following table.

**Table 6.** Reasons of Violation as Perceived by Respondents

Description	Frequency	Percentage
No reply	53	62.4
The gears are cheap	2	2.4
Boundary are not clearly defined	1	1.2
The other nets are not productive	3	3.5
Easy to operate	10	11.8
Maintenance is easy	1	1.2
No sanction	4	4.7
No body violate	5	5.9
Prohibited gears operate only during off season	6	7.1
Total	85	100.0

Source: Primary data, processed.

Most respondents in Pemalang confessed that they employ trawl to harvest fish because trawl is the most efficient gear, easy in operation, least in operational cost but provides very productive catch. The other salient reasons raised by respondents why fishers do violate the regulations or restrictions are because: (1) no boundary is clearly defined, thus difficult for fishers to determine the prohibited area; (2) they do not have alternative job outside fisheries; (3) they do not have a better gear (prospective nets); (4) there is no strict deterrence sanction imposed to the violator; (5) people trust only to the legitimate government.

These reasons of violation perhaps can be considered as the important input for compliance betterment since these opinions were taken from the “actor” of violation. Several efforts which should be formulated for alleviation of the offences committed by fishers include: (1) enforcement officers must strict, (2) fair action (penalty and sanction) for the violators, especially to the large-scale and/or foreign boat, (3) integrated surveillance and enforcement schemes, (4) to find the productive gears with cheaper operational cost but environmentally friendly, and (5) proper and fit management schemes. The detail suggestions as suggested by respondents to improve compliance are summarized in Table 7.



**Table 7.** Suggestions to Alleviate the Non-Compliance of Fishers

Description	Frequency	Percentage
No reply	63	74.1
Officers must strict	2	2.4
Negotiable	2	2.4
Need awareness among the stakeholders	1	1.2
Need extension	1	1.2
Strict rules	4	4.7
Need integrated surveillance	4	4.7
Good understanding among fishers	1	1.2
Strict sanction	3	3.5
Total	85	100.0

Source: Primary data, processed.

About three-fourth (74.1%) of respondents provided no reply answer (missing variable) to response the suggestions for alleviating non-compliance activities. This group of respondents could be included either as the potential violators group (since usually difficult for people to confess them-self as violators) or as the risk-averse group who behaved indifferently or ignorant (do not want to advise others because they might engage to the illegal activities. Therefore, they felt not eligible to speak-out for some advices about violation). Compliance is however necessary for successful management of the fisheries. The challenge is how to secure compliance as efficient as possible. In fact, enforcement is often linked with securing compliance. Traditionally, high level of enforcement or deterrence will result in a high compliance level. But, enforcement is costly and the authorities tend to face declining budgets. Therefore, the alternative ways for securing compliance of fishers, may include: (1) educating fishers with the actual information and current issues, including socialization of rules and/ or regulations; (2) creating diversification of income, especially from outside of the fisheries sector; (3) imposing the deterred penalty and sanction to the violators; (4) conducting integrated surveillance and

enforcement system; (5) empowering social-religion leaders in propagating for better compliance; (6) empowering the fisheries officers and the related authorities in order to develop work attitude of good and clean governance; and (7) introducing co-management approach as the alternative way to secure compliance.

## CONCLUSION

Individual person has multi-dimensional motives and interests, thus to predict the compliance behavior of people is not just a simple task but must rely on the normal situation and condition. Violation behavior tends to be influenced by the contextual situation and condition of the individual. This study concludes that the strategy to secure compliance for the certain target of people should be developed with unique design in order to fit with the situation they are in. In addition, fisheries management authorities should also explore alternative approaches for managing fisheries such as community-based or co-management approaches as suggested by several authors (Pomeroy et al., 1994; and Susilowati, 2001).

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### APPENDIX 1 Profile of Respondents

No	Age (year)	Freq.	%
1	Less than 21	8	9.4
2	21 – 30	40	47.1
3	31 – 40	25	29.4
4	41 – 50	11	12.9
5	More than 50	1	1.2
	Averaged	31.1	
	Total	85	100.0
No	Length (year)	Freq.	%
		7	8.2
2	6 – 10	28	32.9
3	11 – 15	17	20.0
4	16 – 20	14	16.5
5	More than 20	19	22.3
	Averaged	15.6	
	Total	85	100.0
No	Education	Freq.	%
2	Elementary School	76	89.4
3	Junior High School	9	10.6
4	Senior High School	-	-
	Total	85	100.0
No	Tonnage	Freq.	%
		51	60.0
2	11 – 20	22	25.9
3	21 – 30	9	10.6
4	31 – 40	3	3.5
5	More than 40		
	Averaged	12.1	
	Total	85	100.0
No	Horse Power	Freq.	%
2	11 – 20	8	9.4
3	21 – 30	10	11.8
4	31 – 40	10	11.8
5	41 – 50	20	23.5
6	51 – 100	4	4.7
7	101 – 150	25	29.4
8	151 – 200	8	9.4
9	More than 200		
	Averaged	68.7	
	Total	85	100.0
No	Number of Crews	Freq.	%
1	Less than 6	66	77.6
2	6 – 10	3	3.5
3	11 – 15		
4	16 – 20	8	9.4
5	More than 20	7	8.2
6	No reply	1	1.2
	Averaged	7.1	
	Total	85	100.0
No	Gears	Freq.	%
1	Arad/Cothok	7	8.3
2	Cantrang	27	31.8
3	Trammel Net	2	2.4
4	Dogol		
5	Rawe		
6	Gilnet	4	4.7
7	Kantong	13	15.3
8	Kejer	7	8.2
9	Nilon	5	5.9
10	Payang	3	3.5
11	Purse Seine	13	15.3
12	Shrimp	4	4.7
	Total	85	100.0

