# The Behavior of Fishpond Farmers with Silvofishery Insight and its Effects on Biodiversity of Macrozoobenthos in Mangrove Ecosystem of Coastal Area

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**Abstract:** Mangrove ecosystem is an open ecosystem of various orientation of human interests in coastal areas, so that its position as common property makes these ecosystems are vulnerable to all forms of exploitation and environment manipulation that occur in it. Some areas in South Sulawesi Province has experienced such things, one of which is Sinjai district which has an area bordering dominated coastal mangrove vegetation has been experiencing a crisis of environmental degradation, at least negative impact has been felt since 10 years ago. The reason for the coastal area is converted to farms and settlements area. In optimizing the role of fish farmers against Silvofishery program which has been running since 10 years ago, and to avoid the negative impact of prolonged crises of environmental degradation, the need to study the problem formulation through research questions, as follows: (1) Whether the insight of environment knowledge, ecosystems, conservation, attitude and motivation affect the behavior of fish farmers with Silvofishery insight? (2) Whether the behavior of Silvofishery concept can maintain biodiversity that meet the natural standards as ecosystem feasibility? Based on the problem formulation, the objectives of this study was; (1) to analyze the effect of knowledge, attitude and motivation of fish farmers against Silvofishery insightful behavior, (2) to analyze the effect of behavioral patterns of fish farmers with Silvofishery insight that can maintain the natural biodiversity as ecosystem feasibility standard. With a package of biodiversity analysis and quantitative approaches through Structural Equation Model analysis of case-study research data obtained through questionnaires distribution, so that obtained the results below. The results of study showed that: (1) the knowledge insight does not affect the behavior of fish farmers with Silvofishery insight; (2) there is a positive contribution to the fish farmers attitude with Silvofishery insight; (3) there is a positive contribution of motivation to the behavior of fish farmers with Silvofishery insight; (4) patterns of Silvofishery insightful behavior of fish farmers showed biodiversity that meet natural standard of ecosystem feasibility. Thus, the exogenous variables of study ie research knowledge, attitudes and motivation, directly has a major role in influencing the behavior of endogenous variables of Silvofishery insight as a concept of integrated ecosystem management that are environmentally friendly and can maintain the natural biodiversity as a guidance of viable environment quality in a sustainable manner.

**Keywords**: Behavior; silvofishery; biodiversity

## 1. Introduction

Mangrove ecosystem is an open ecosystem of various orientation of human interests in coastal areas, so that its position as common property makes these ecosystems are vulnerable to all forms of exploitation and environment manipulation that occur in it. Some areas in South Sulawesi Province has experienced such things, one of which is Sinjai district which has an area bordering dominated coastal mangrove vegetation has been experiencing a crisis of environmental degradation, at least negative impact has been felt since 10 years ago.

The reason for the coastal area is converted to farms and settlements area. East Sinjai sub-district, Sinjai district as an example the case of the last ten years, are now feeling the impact of ecosystem improvement through self-help communities develop an integrated mangrove areas to aquaculture through the concept of *integrated farming system* with silvofishery program (Sulia *et al.,* 2010). However, some people especially fish farmers are still reluctant to join the program is constrained by the rules of protected area policies, lack of knowledge, as well as environmental attitudes and behavior patterns that are still happy with the pattern of old traditions of their ancestors. Along with the rules of protected forest policy, local government consistently gave permission of mangrove areas management as long as the concept of integrated ecosystem and mangrove (silvofishery).

In optimizing the role of fish farmers against silvofishery program which has been running since 10 years ago, and to avoid the negative impact of prolonged crises of environmental degradation, the need to study the problem formulation through research questions, as follows: (1) Whether the insight of environment knowledge, ecosystems, conservation, attitude and motivation affect the behavior of fish farmers with silvofishery insight? (2) Is there a positive contribution to the knowledge insight on attitudes in influencing the behavior of fish farmers with silvofishery insight? (3) Is there a positive contribution of knowledge insight on motivation in influencing the behavior of fish farmers with silvofishery insight? (4) Whether the behavior of silvofishery insight can maintain natural biodiversity that meet ecosystem feasibility standard?

Based on the problem formulation above, the objective of this study was; (1) to analyze the effect of knowledge, attitude and motivation of fish farmers against silvofishery insightful behavior, (2) to analyze the contribution of knowledge insight on attitudes in influencing the behavior of fish farmers with silvofishery insight (3) to analyze the contribution of knowledge insight on motivation in influencing the behavior of fish farmers with silvofishery insight; and (4) to analyze the effect of fish farmer with silvofishery insight who can maintain natural biodiversity that meet ecosystem feasibility standard?

Based on the objectives to be achieved, then the study is expected as follows: (1) as a reference for government and relevant agencies in planning policies and coastal ecosystems management, especially associated to the silvofishery pond management in the mangrove ecosystem zone; (2) as input in the development of science in the field of

education, especially environmental education; and (3) as a reference point for the community, especially fish farmers in developing silvofishery activities are environmentally friendly and sustainable in the mangrove ecosystem.

## 2. Materials and Methods

### *2.1 Time and Location*

The study was conducted for approximately 9 (nine) months, starting from the May 2014 until the end of January 2015, which is located in the coastal area of East Sinjai subdistrict, Sinjai district in South Sulawesi, Indonesia. The location of study include five (5) villages that have coastal areas bordering Bone's Gulf waters, i.e Samataring, Tongke Tongke, Panaikang, Pasimarannu, and Sanjai villages (Figure 1).

### *2.2 Population and Sampling*

The populations in this study are fish framers that their concentrations of residence and work activities are in around mangrove zone the coastal area of East Sinjai subdistrict, Sinjai district and their main job as fish farmers. This population is determined by 200 respondents purposively and proportional of all fish farmer population in five villages in East Sinjai subdistrict, Sinjai district.

Determination of total samples in each villages in research site proportionally with to the calculation as follows:

$$\text{The number of respondent per village} = \frac{[\text{Resident population in each village}]X[\text{total respondent}]}{\text{Total population for all village}}$$

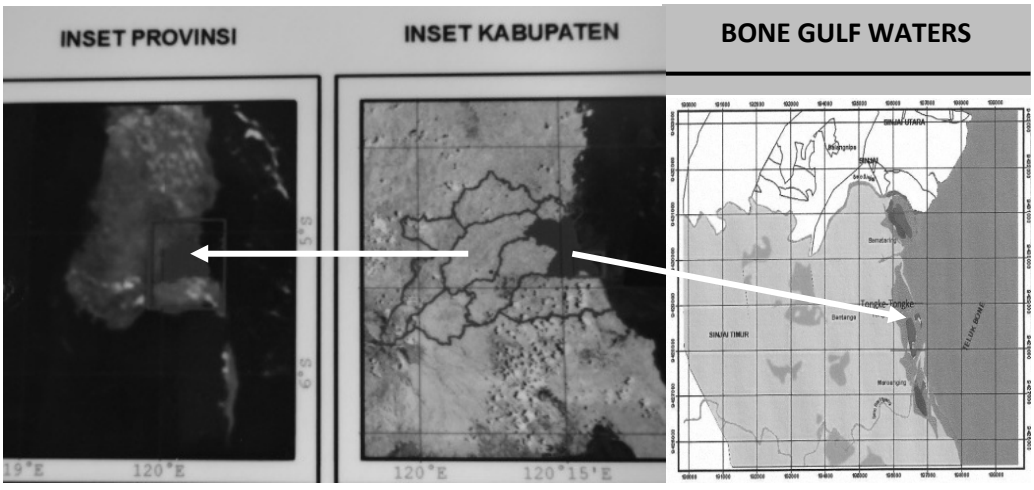


**Figure 1**. Research site in East Sinjai Subdistrict, Sinjai District and Bone Gulf Waters, South Sulawesi (BPS Sinjai, 2013)

### *2.3 Data*

The data obtained in this study is divided into two parts, i.e primary and secondary data. Primary data is data obtained directly from the respondents in the research site through direct interviews and through research instruments. Secondary data is data that has been previously obtained and documented by a particular agency or institution, obtained to complement and support

the development of primary data. Examples of primary data in this study is all the data relating to the indicators of exogenous latent variables (independent) and endogenous (dependent) which then becomes the data to be analyzed in taking conclusions. While secondary data include the geographical situation such as maps and area topographic, demographics and population, as well as data concerning the condition and extent of mangrove areas either already exploited for the development or use, and which is still in a state of natural ecosystems.

*2.4 Data Collecting*

Taking or primary data collecting of research variables is conducted with a research instrument in the form of a sheet that contains a number of written questions to the respondents regarding the study variables.

2.4.1 Knowledge insight

Evaluation of knowledge level for fish farmers are categorized by scale degrees of knowledge, i.e: a) very do not understand, b) do not understand, c) quite understand/moderate, d) understand and e) very understand.

2.4.2 Attitude

This attitude variables is relevant to the questions lattice or instrument statement for attitude development process includes econic, affective, and conative and then quantified with Likert scale: disagree = 1, less agree = 2, agree = 3, and very agree = 4.

2.4.3 Motivation

Statement of motivation instrument test is directed to the preference of answer based on the degree of agreement with regard to the factors driving the desire for an activity or observation object. The degree of agreement following the Likert scale as attitude variables.

*2.5 Behavior of Land Conversion Pattern*

The third of mangrove conversion behavior patterns that occur in the field, i.e: a) trench path, b) dike path, and c) middle path are relevanced with the statement of test lattice of behavioral indicators includes: 1) environmental behavior, 2) preserving ecosystems, and 3) environmental conservation/ ecosystem. The degree of intensity frequency or frequency of occurrence of an activity that shows behavior consistency in integrated-mangrove and pond management integrated (silvofishery) as an answer for testing format that proposed by category: a) never, b) rarely, c) frequently, and d) always.

*2.6 Biodiversity Data Collection*

The data of makrozobentos abundance is conducted at three stations with respect to the seabed sediments in the third of silvofishery management pattern, i.e trench path, dike path, and middle path. By using *Scopnet* and "*Ekman Dredge*" 14x16 cm in opening, macrozoobenthos samples can be filtered by "*seine net*" 0.5 mm in diameter. Samples were obtained preserved in the sample bottle with 4% formalin solution, and then identified at the Marine Biological Laboratory Faculty of Marine and Fisheries Hasanuddin University. The method of sample plots 5 x 5 $m^2$, then the abundance or density of macrozoobenthos along its biodiversity package can be obtained by the following equation (Odum, *et al.,* 1975 in Meadows, and Campbell, 1988); H' = -

$\sum [n_i / N][\log_e n_i / N]$; $N \approx Y = \frac{10.000 \times a}{b}$ $Y = \frac{10.000 \times a}{b}$; $E = \frac{H'}{Hmax} \frac{H'}{Hmax}$; $C = \frac{\epsilon ni(ni-1)}{N(N-1)}$ $\frac{\epsilon ni(ni-1)}{N(N-1)}$; and D = 1- C (expected dominant index). [Note; H '= biodiversity index; E = equitability index; $H_{max} = \text{Log}_e S$ (S = number of species found); C = Simpson's dominant index; N = total number of individuals; ni = Number of individuals of each species]. By going through the formula, then conducted biodiversity, equitability, dominance index analysis.

2.6.1 Statistical Analysis

The design of equation model *Structural Equation Modeling* (SEM) with AMOS 2.2 program (Yamin and Kurniawan, 2009; Sarwono, 2012; and Santoso and Singgih (2014) as reference in this study as follows: $\eta_1 = PyX_1 + PyX_2 + PyX_3 + Ɛ,,$ with $P_{yi-3}$ = direct relationship of exogenous variable on endogenous; $X_{i1-3} = \lambda\lambda_{1-4} Ɛ_x + \delta_{1-3}$ (measurement of each exogenous variable); $Y_{i1-3} = \lambda_{1-3} \eta_{1-2} + \epsilon_{1-3}$ (measurement of each endogenous variable).

To see the contribution of silvofishery behavior pattern selected by peoples towards biodiversity X → Y (Figure 1), then this causal relationship is also formulated into *Structural Equation Modeling*, namely $\eta_2 = QyY_1 + Ɛ,,$ where $Qy_{i2}$= direct relationship of biodiversity variable to silvofishery. To test the hypothesis, then seen by a comparison between the difference of reliability relationship (*Construct reliability* = R) as extracted variance with a t-statistic value (= 1.96). If all indicator factors have t-statistic > 1.96, then these factors are considered significant or have a good validity. Conversely, if t-statistic < 1.96, then these factors are considered insignificant or invalid. Formulations for reliability test and validity in SEM according to Yamin and Kurniawan (2009), as follows:

$$\text{Construct reliability} = \frac{(\Sigma\lambda i)2}{(\Sigma\lambda i)2+\Sigma ej} \text{ ; atau } \frac{(\Sigma loading\ baku)2}{(\Sigma loading\ baku)2+\Sigma ej}$$

$$\text{Variance extracted} = \frac{[\Sigma\ (loading\ baku)2]}{[\ \Sigma(loading\ baku)2]+\Sigma ej}$$

## 3. Results and Discussion

### *3.1 Direct Effect of Intervariables*

3.1.1 The effect of knowledge on environment attitude

Based on the result of SEM analysis with AMOS 22 Program (Table 1 and Table 2), the effect of environmental-insightful knowledge on environmental attitudes are significantly positive for 0.762 with a probability value (*p*) of 0000. This effect is shown by CR value significantly by 4.172 > 1.96 with a positive correlation coefficient of 0.762 at the level of probability (*p*) of 0000. The level of probability (p) < 0.050, it can be stated that the null hypothesis ($H_0$) is accepted, it means there is an effect of environmental knowledge on environmental attitudes. The coefficient of effect is positive R = 0.762 indicates that the higher of environmental-insightful knowledge, the higher of environmental attitudes with percentage of effect by $R^2 = 0.5806$ or 58.06 % in the integrated –ecosystem management of ponds and mangrove in coastal areas.

As implications of analysis showed a positive effect for knowledge on the attitude of environmental, then every knowledge indicators as *loading factor* directly also affects the consistency of aconic attitude concerning the people's perception (fish farmers) about something about an object/envi-

ronment; *affective* attitude (feeling someone about something regarding environmental objects); and *conative* attitude (factor of a person's tendency to act to do something about the natural environment. Relating these results, Choong *et al.,* (1990) earlier explained that the management of mangrove forests in Indonesia needs to be in line with the development of the quality of the knowledge and attitude of the coastal areas as human resource assets.

Each *loading factor* of each of attitude indicator as described in its effect on the silvofishery insight depends positively on the improvement of knowledge insight.

3.1.2 The effect of knowledge on motivation

Based on the description of SEM analysis result using AMOS 22 program previously, that the influence of environmental-insightful knowledge to the environmental motivation as large R = 0.140 positive with CR = 1.232 < 2.56 at the level of probability (p) of 0218 (Tables 1 and 2). The probability value (p) > 0.05, so it can be stated that the null hypothesis ($H_0$) is rejected, it means there is no effect of environmental-insightful knowledge on environmental motivation. The coefficient of effect is positive, which may indicate that the higher of environmental-insightful knowledge level, the higher of environment motivation or otherwise with *loading factor* contribution that can be accessed from the indicators of environmental knowledge of 0.68 or 68%.

Based on these results, showing that not always knowledge has high consistency on environment motivation. Spontaneous experience directly seen and felt sometimes more influential than formal education or knowledge that has been experienced. A human with broad-knowledge are often not in line with the direct experience of a profitable and highly motivated to give consistency to the activity compared with many ideals, passion, and desire due to

**Table 1**. Regression Weights: (Group number 1 - Default model)

| | | | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|---|---|
| ATTITUDE | <--- | KNOWLEDGE | .441 | .106 | 4.172 | *** | par_1 |
| MOTIVATION | <--- | KNOWLEDGE | .173 | .141 | 1.232 | .218 | par_13 |
| BEHAVIOR | <--- | KNOWLEDGE N | .073 | .115 | .068 | .976 | par_2 |
| BEHAVIOR | <--- | ATTITUDE | .950 | .216 | 4.399 | *** | par_3 |
| BEHAVIOR | <--- | MOTIVATION | .202 | .047 | 4.284 | *** | par_4 |

**Table 2**. Standardized Regression Weights: (Group number 1 - Default model)

| | | | Estimate |
|---|---|---|---|
| ATTITUDE | <--- | KNOWLEDGE | .762 |
| MOTIVATION | <--- | KNOWLEDGE | .140 |
| BEHAVIOR | <--- | KNOWLEDGE | .065 |
| BEHAVIOR | <--- | ATTITUDE | .812 |
| BEHAVIOR | <--- | MOTIVATION | .360 |

know many issues. This becomes negative side of old tradition habit of conventional management as a bad experience for fish farmers in coastal areas. Which encourages personal motivation, not absolute benefit to the environment ecologically, and this needs to be integrated with environmental awareness as part of the ecosystem. This is shown most coastal communities that have always migrated from the coast of the island to the other coast of the island and this affects the geography of the coast (Fauzy *et al*., 2009).

3.1.3 The effect of knowledge insight on behavior

Based on the description of SEM analysis result using AMOS 22 program previously, that the effect of environmental-insightful knowledge on silvofishery insightful behavior of R = 0.065 positive with probability (p) of 0.976. The probability value (p) > 0.05 (Table 1 and 2).

Due to the *Critical Ratio* (CR) value the comparator by 2.56 is larger than CR produced by program as large 0,030 with p > 0.05 so it can be concluded that the null hypothesis ($H_0$) is rejected, it means that there is no effect of environmental-insightful knowledge on silvofishery behavior. This implies that the actualization of consistency between the cognitive aspects on motoric actions do not always have a direct relevance, there are times when realizing a low consistency.

It is influenced by someone's internal factors such as habits, age and individual experience, whereas the external factors of environment influence itself that is difficult to change the behavior pattern to a more positive direction.

Although the knowledge insight by model analysis structural revealed no effect with small CR (0,030) on the probability p = 0.976 > α = 0.05, the coefficient of effect is positive which may indicate that the higher of environmental-insightful knowledge, the higher of silvofishery consistency behavior which can be contributed in the integrated management of coastal areas. Knowledge is not always in line with the behavior and mental experiences that need to be established on the local environmental situation that encourages the application of the positive aspects of knowledge as well as the behavior of coastal communities silvofishery (Hossain *et al.,* 2008)

3.1.4 The effect of environment attitude on behavior

Based on the description of SEM analysis result using AMOS 22 program previously, that the effect of environment attitude on silvofishery behavior with the *critical ratio* (CR) of 4.399 with a correlation coefficient R = 0.812 positive with a probability value (p) of 0000 (Table 1). The probability value (p) < 0.05, so it can be stated that the null hypothesis ($H_0$) is accepted, it means that there is a significant relationship between environmental attitudes on silvofishery-insightful behavior.

The coefficient of effect is positive, which may indicate that the higher of environmental attitudes, the higher of silvofishery-insightful consistency behavior that can be contributed through the *loading factor* of each indicator of environmental attitudes. So each *loading factor* (LF) capacity of at-

titude indicator as described below has a positive impact on the integrated-ecosystem management of mangrove and ponds, both on the pattern of trench path, dike path, or pond path.

The coefficient of environmental attitude on positive behavior, indicate that the higher of environmental attitudes, the higher of behavior in silvofishery management or vice versa with the contribution effect as large R = 0812 positive or $R^2$ = 65.9344%.

The implications of a positive correlation influence of environmental attitudes on the behavior of fish farmers with silvofishery insight, it means that each indicator and its *loading factor* capacity, make fish farmers can determine attitude to act as follows;

- Convert unproductive mangrove land to silvofishery land productively without damaging its mangrove,
- Arrange the mangrove planting patterns, both as a pattern of trench path, dike path, or pool path,
- Making the mangrove root system as a barrier and filter system (bio-filter) of natural and domestic waste,
- Like to smooth irrigation system in the trenches pond with a parallel system for the purpose of efficient use of fresh water as well as the use of turbine energy for air circulation (oxygen),
- Like to lifting, cleaning, drying and burning saturated trash with decay process in the trench bottom,
- Like to implement polyculture system shrimp-fish, and crabs (with cage system) as a form of land efficiency silvofishery in trench path with mangrove portion and pond of 70: 30.

In line with the actions of the environment, according to Lewis (1999) will be needed in restoring any natural components that undergo severe exploitation as well as the total conversion of mangrove ecosystem impacts of various requirements, especially aquaculture and settlements

3.1.5 The effect of motivation on behavior

Based on the description of SEM analysis result using AMOS 22 program previously, that the effect of environment motivation on environmental-insightful Silvofishery behavior of R = 0.360 positive with CR = 4.284 > 2.56 in the probability (p) of 0.000, it means that the probability value of less than 0.05 (Tables 1 and 2). The probability value (p) < 0.05, so it can be stated that the null hypothesis ($H_0$) is accepted, it means there is a significantly influence between environment motivation on silvofishery behavior. The effect coefficient is positive, which may indicate that the higher of environment motivation level, the higher of silvofishery behavior or vice versa with the effect coefficient of R = 0.36 or $R^2$ = 12.96% which can access the respective measure of *loading factor* in motivation indicator.

This motivation arises due to the encouragement to meet the needs, while the needs derived from environmental resources aspects. Morgan (1986, in Soekamto and Winataputra, 1997) states that motivation is driving force or towing interest that causes a person to behave/act toward a specific goal.

*Loading factor* of indicator this motivation variable shows the approval level of motivation statement as a driving factor of fish farmer communities from agrees category to strongly agree includes aspects: 1) environment motivation, 2) ecosystems motivation, 3) conservation motivation.

3.1.6 Indirect effect and total effect

Based on SEM analysis with AMOS 22 program can be seen that the indirect effect of environmental knowledge through attitude toward fish farmer's behavior with silvofishery insight of R = 0.653 positive or correlation coefficient $R^2$ $(0.653)^2$ or 42. 641%. While the total effect (number of direct + indirect effects) of knowledge variable on behavior through attitude as large 0.065 + 0.653 = 0.718. It can be concluded that the total effect of knowledge variable on behavior through attitude is positive attitude with R = 0.718 or of $R^2$ = 51.55%.

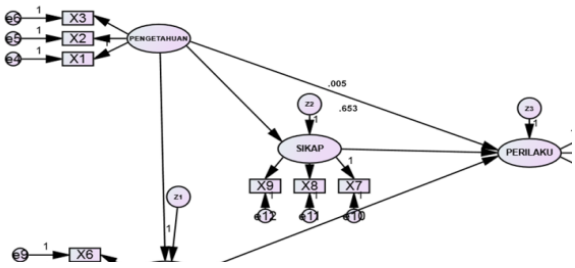


**Figure 2**. *Standardized Indirect Effects*

*3.2 Discussions of Variable Regression of Behavior ($Y_1$) on Biodiversity ($Y_2$)*

3.2.1 Hypothetical test the silvofishery-insightful behavior with trench path correlated to biodiversity

Based on the testing table (Table 3) can be seen that t-test of 15.713 with a significant value of (0.000) is smaller than 0.05. Because t-test (15.713) is greater than t-table (1.973) on the error rate of 5%, the null hypothesis ($H_0$) is accepted and $H_1$ rejected that shows there is a strong correlation in which the silvofishery-insightful behavior with trench path ($X_1$) is influential on specimen of aquatic sediments around integrated ecosystem of ponds and mangroves in coastal areas. The implications of this analysis requires any action of Silvofishery-insightful behavior; converting unproductive mangrove land into silvofishery land productively without destroying its mangrove, arrange mangrove planting pattern, both as a pattern of trench path, dike path, or pond pool, and make the mangrove root system as a barrier and filter system (biofilter) of natural and domestic waste, and several other activities that reflect silvofishery insightful behavior action as noted earlier in the discussion of the efefct of attitudes on behavior will affect the creation of a stable ecosystem in the diversify of bottom waters biota specimens as biodiversity standards expected.

Based on Figure 3 below, it is clear that the t-test falls in rejection area $H_1$. It can be concluded that the Silvofishery insightful behavior of trench path is influential positively on biodiversity that can be interpreted that the higher of consistency of silvofisher insightful behavior of trench path are applied, the higher of biodiversity index quality occur or otherwise. For more details, the picture of rejection and acceptance of hypothesis is shown below:

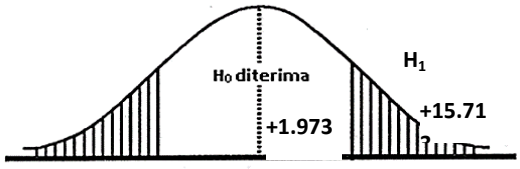


**Figure 3**. Acceptance curve $H_0$ and rejection $H_1$ based on t-test the effect of Silvofishery of trench path on Biodiversity

3.2.2 Hypothetical test the silvofishery-insightful behavior with dike path correlated to biodiversity

Based on the testing table (Table 3) it can be seen that t-test of 3.540 with the

significance level of (0.001) is smaller than 0.05. Due to t-test (3.540) is greater than t-table (1.973) of error level 5%, $H_0$ is accepted and $H_1$ is rejected it shown that there is a strong correlation which silvofishery insightful behavior with dike path ($X_2$) is influential on the biodiversity of water sediment in the coastal area. The acceptance curve of null hypothesis ($H_0$) and rejection ($H_1$) is shown on figure 4 as follow:

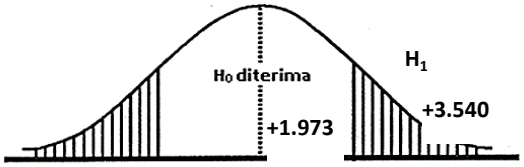


**Figure 4**. Acceptance curve $H_0$ and rejection $H_1$ based on t-test the effect silvofishery of dike path on biodiversity

Based on figure 4, it seen that t-test falls in rejecting area $H_1$. Thus, it can be concluded that the silvofishery behavior with dike path pattern is influential positively and significant on biodiversity it can be meant that the higher of consistency of silvofishery insightful behavior with dike path, the higher of biodiversity index quality in the water bottom.

3.2.3 Hypothetical test the silvofishery-insightful behavior with pond path correlated to biodiversity

Based on the testing table (Table 3) before, can be seen that t-test of 4.789 with a significant value of (0.000) is smaller than 0.05. Because t-test (4.789) is greater than t-table (1.973) on the error rate of 5%, then $H_0$ accepted and $H_1$ rejected that shows a strong correlation where the behavior of silvofishery insightful of pond path ($X_3$) influence the biological specimen diversity at aquatic sediments in coastal areas. The acceptance curve of null hypothesis ($H_0$) and rejection of hypothesis 1 ($H_1$) is shown in figure 5 below:

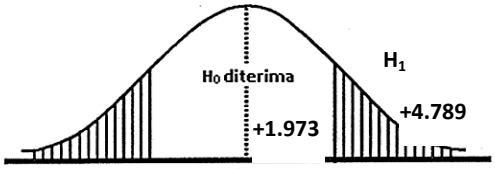


**Figure 5**. Acceptance curve $H_0$ and rejection $H_1$ based on t-test the effect Silvofishery of pond path on biodiversity

Based on these figure, it appears that t-test falls in the rejection area $H_1$. It can be concluded that the behavior of silvofishery insight of pond path is positive effect and significant on biodiversity that can be interpreted also that the higher of consistency of silvofishery insightful behavior for pond path, the higher of biodiversity index quality at the bottom, and it marked the guarantee of aquatic ecology quality in the integrated management of ponds and mangrove ecosystems. The analysis of this hypothesis can be explained that the ten items of behavior statement with high consistency to very high which is contained in the research instrument represents silvofishery insightful behavior of pond path which can realize the feasibility of natural waters quality with biodiversity index quality presented (Tabel 3). According to Clough *et al*., (2002), in general the types of silvofishery applied in the area of coastal ecosystems while maintaining natural ecological functions including biodiversity as an indicator of ecological quality, although there are aspects of environmental manipulation in it.

**Table 3**. Standardization of correlation coefficient of behavior variabel on biodiversity

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 3.190 | .908 | | 3.513 | .001 |
| | BEHAVIOR_*SILVOFISHERY*_TRENCH_PATH | .579 | .037 | .681 | 15.713 | .000 |
| | BEHAVIOR_*SILVOFISHERY*_DIKE_PATH | .134 | .038 | .157 | 3.540 | .001 |
| | BEHAVIOR_*SILVOFISHERY*_POND_PATH | .154 | .032 | .189 | 4.789 | .000 |

a. Dependent Variable: BIODIVERSITY

## 4. Conclusion

The environmental knowledge insight, ecosystems and conservation does not directly influence the silvofishery insightful behavior. With the coefficient of knowledge effect is positive, it means that knowledge indicator needs to be improved its quality due to the large of knowledge insight the higher of fish farmer behavior consistency in integrated ecosystem management in coastal areas. The environmental knowledge insight, knowledge of ecosystems, conservation were directly influence positively on environmental attitudes. It means that the knowledge insight to contribute positively to the environmental attitudes of fish farmers in the realization of an integrated pattern of mangrove ecosystem management and aquaculture.

Knowledge insight does not affect the environmental motivation. But motivation positively has directly effect on the behavior of fish farmers with silvofishery insight. It shown that the higher of motivation consistency on fish farmers, the higher of silvofishery behavior consistency that accompanies fish farmers in the management of integrated ecosystem in the coastal areas. The contribution of motivation effect of fish farmers in each indicator of highest to lowest motivation consistency is sequentially ecosystems, environmental, and conservation motivation. The behavior of silvofishery insightful, both in trench, dike, and pond path contribute positively to maintaining the aquatic ecosystems feasibility of coastal areas. This is evidenced by the positive influence of density and diversity index package (biodiversity) of macrozoobenthos i.e *equitability index* and *dominance index* in pond water of silvofishery.

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