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Intra- and inter-village conflict in rural coastal communities in Indonesia: The case of the Kei islands

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Abstract

Using the data collected by a survey of small-scale fishing households from rural coastal communities in Indonesia, we examine the underlying factors that may potentially be associated with the incidence of conflicts among local marine resource users. Intra-village and inter-village conflicts are examined separately. We find that social relationships and individual perceptions of changes in fishery conditions are significantly associated with the incidence of both intra- and inter-village conflicts. We confirm that declining fish stocks is positively associated with inter-village conflicts but not with intra-village conflicts; while increasing catch is positively associated with intra-village conflicts but not with intra-village conflicts.

Keywords: local conflict; rural coastal community; Indonesia; small-scale fishery; rural development

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1 Introduction

Literature on civil conflicts around the world has been widely available for a long time, with recent studies including Blattman and Miguel (2010), Collier and Howffler (2004), Collier (2009), and North, Wallis, and Weingast (2009). Common causes of civil conflicts, among others, include an unequal distribution of political power and economic welfare among different socio-economic groups, a division between ethnic or religious groups, and weak state capacity to prevent and resolve conflicts. Like most nations worldwide, Indonesia has in the past experienced a number of civil conflicts, which resulted in direct cost of lives, livelihoods and infrastructure throughout the country, and some districts, particularly rural areas, are more prone to violent conflict (Barron, Kaiser, & Pradhan, 2009). Literature on civil conflicts in Indonesia has been available since at least 1950 (van der Kroef, 1950) and studies so far have focused on conflicts related to military-backed attacks destroying movements opposed to the central government (Anderson & McVey, 1971; Aspinall, 2007).

A few years after the fall of Soeharto in 1998, there were sparks of communal conflict that were not initiated by a military attack in Indonesia. For example, the United Nations Support Facility for Indonesian Recovery (UNSFIR) recorded that the number of communal conflicts more than tripled from 1997 to 1999, although the number of conflict-related deaths and incidents has declined since this period (Varshney, Panggabean, & Tadjoeddin, 2004). These post Soeharto non-military conflicts have also triggered the development of a new literature on communal conflicts in Indonesia (Tajima, 2014; van Klinken, 2007). Most Indonesian conflict literature, however, has focused on large-scale or headline conflicts and, to date, relatively few studies have examined small-scale or local conflicts. Although local conflicts do not make headlines, they are often violent, causing destruction of livelihoods as well as serious injury and often resulting in death. What is even more limited in this literature is a quantitative case study based on a household survey designed to understand the patterns, causes and impacts of non-headline local conflicts. While two recent quantitative studies by Tadjoeddin and Murshed (2007) and Barron, et al. (2009) focus on violent local conflicts in Indonesia, these studies are based on high level data; that is, either district-level data retrieved from the UNSFIR database or village-level data drawn from the Village Potential Statistics (PODES). Variation in the types, sources and impacts of local conflicts does exist such that, while cross-district and cross-village analysis have been able to build up links to the theory of conflict, a quantitative analysis based on household-level data is crucial to deepening our knowledge of local conflicts (Blattman & Miguel, 2010).

In this paper, we use household-level data to empirically explore the pattern of local conflicts among individual marine resource users in small-scale fishing villages in Indonesia. We undertook a household survey of 296 households from fishing villages in the Kei islands, which are situated in

southeast Maluku of Indonesia. Previous field studies identify that the small-scale fishing households in the region are prone to local conflicts because of religious, ethnic and kinship segregation as well as because of poverty, socioeconomic inequality, and the decline in natural resources (Adhuri, 2013; Girsang, 2011; Thorburn, 2000). Using the household survey data, we apply a binary regression model to explore the underlying factors that may potentially be associated with the probability of individual fishers being involved in a conflict with other local marine resource users.

In the last two decades, there has been a growing body of literature exploring the nexus between civil conflicts and natural resources (Homer-Dixon, 1994; Nillesen & Bulte, 2014; Ross, 2004). It is important to improve our understanding of the patterns of local conflicts across coastal regions in Indonesia and the link between their occurrence and different aspects of small-scale fisheries as well as changes in the natural and social environment within which the artisanal fishing activities are undertaken. Indonesia is the world's largest archipelago nation with over 13,000 islands and has the sixth largest exclusive economic zone. By the early 2010s Indonesia had become the second largest marine capture fisheries producer after China (FAO Fisheries and Aquaculture Department, 2014). A distinctive characteristic of Indonesia's marine capture fisheries is that, unlike other large developed fishing nations, small- scale fisheries account for a large share of production. For example, only 25 percent of the fishing vessels operating in Indonesia in 2012 were equipped with inboard motors, and more than 70 percent of these vessels were less than 5GT (DGCF, 2013). While the contribution of fish production to Indonesia's total GDP is relatively small (< 2 percent in 2007), it creates significant employment opportunities in the vast coastal areas and provides the government with an important source of foreign exchange. Fish also accounts for more than 50 percent of animal protein intake and, in particular, rural coastal communities, such as those in eastern Indonesia, rely heavily on marine resources for their livelihood (World Fish Center, 2011). The sustainable use of local marine resources therefore plays a crucial role in improving the food security and alleviating poverty among rural coastal communities (Béné, Macfadyen, & Allison, 2007).

Despite the small scale of individual fishing operators, there is growing concern about the ecosystem impacts of fishing and the health of marine resources in Indonesian waters. Major causes for concern, among other things, include the increasing number of both legal and illegal domestic fishers as well as fleets from foreign countries, and the increasing access to more modern fishing equipment (Resosudarmo, Napitupulu, & Campbell, 2009; Williams, 2007).[1] The economic wellbeing of small-scale fishing households in Indonesia is sensitive to changes in the near coastal environment as they operate within the areas around the villages, or 12 miles from the shore, given their limited capacity to

[1] Other causes include population growth, poverty and increased demand for fish, pollution from both land- and sea-based activities, and lack of public awareness and scientific knowledge (Heazle & Butcher, 2007; Novaczek, Sopacua, & Harkes, 2001).

travel long distances (Adhuri, 2013; Adhuri & Visser, 2007; Pomeroy et al., 2007; Satria & Matsuda, 2004). The degradation of local fishing grounds not only affects the livelihood of coastal communities, but may also increase competition and create conflict among local resource users for the fewer resources available for exploitation (Bennett et al., 2001). Conflict among local marine resource users is not a problem unique to Indonesia, and has long been recognised and documented worldwide as a problem affecting the wellbeing of coastal communities (Bailey *et al.* 1986; Yamamoto 1995; Masalu 2000; Bennett *et al.* 2001; Salayo *et al.* 2006). Resolving local resource conflicts in developing coastal states is important to improve the productivity of small-scale fisheries and to build the environment for the government to formulate effective management plans. Moreover, when a conflict occurs, it not only creates significant monetary losses for the communities involved but sometimes leads to incidents that result in the death of community members (KIARA, 2012).

There are a number of qualitative studies that focus on individual incidents of conflict over the use of marine resources and explore the causes and impacts of resource conflicts in Indonesia and other countries (Olomola 1998; Thorburn 2000; Bennett *et al.* 2001; DuBois and Zografos 2012; Adhuri 2013). However, quantitative research is underdeveloped with regard to which individual marine resource users are more prone to be involved in local conflict and what attributes of marine resource users are systematically associated with its incidence. In particular, only a limited number of studies have used a relatively large sample of household-level data to explore the underlying factors that may affect the incidence of local resource conflicts. The aim of this paper is to fill this gap and enrich literature on case studies of local conflicts over the use of marine resources. Among the limited literature, two exceptions are Pomeroy *et al.* (2007) and Muawanah *et al.* (2012) who conducted household surveys in fishing communities to explore whether the level of marine resource conflict is reduced by the existence of co-management arrangements in Southeast Asian countries, including Indonesia.

We distinguish different types of local conflict with respect to whether a conflict occurs between marine resources users within the same village (*intra-village conflicts*) or from different villages (*inter-village conflicts*). Salayo et al. (2006) reviewed fishery-related conflicts in South and Southeast Asia and found that each fishery conflict can involve various groups in the local community. In our study, the distinction between the intra- and inter-village conflicts is important because small-scale fishers in rural coastal communities in Indonesia generally have a close working relationship with other fishers in the same village. In other words, the way in which individuals interact with other fishery resource users in the same village is different from how they interact with outsiders. The factors and the extent to which each factor is associated with the incidence of inter- and intra-village conflicts could be structurally different and, hence, each type of local conflict needs to be examined

separately. To date, however, there has been no study that has assessed the potential factors associated with the incidence of intra- and inter-village conflicts separately.

2 Methods

2.1 Research site

Data were collected in the Kei Islands, which are situated in southeast Maluku, Indonesia. The Kei islands form an archipelago of four main islands (Kei Kecil, Kei Besar, Kur and Dullah) plus hundreds of small mostly uninhabited islands, covering 1,384 km^2 of land and 21,916 km^2 of sea. According to the Office of Population and Civil Registration, the total population of the Kei islands, which comprise the Tual city and Southeast Maluku regency, was approximately 189,628 in 2012 (BPS, 2014a, 2014b) and has slowly but consistently increased over time (Adhuri, 2013). The people of the Kei islands come from diverse ethnic and religious backgrounds and live in a multicultural environment.

The main source of livelihood in the Kei islands is agriculture, and the main commodities include cassava (*enbal* in local language) as the staple food, coconut, and nutmeg. Another considerable source of livelihood for the small island communities are the marine capture fishery and other marine based small-scale industries, such as seaweed and pearl cultivation. The Kei islands are also the centre of cultural and marine tourism in the Maluku province as Kei society maintains many cultural traditions and tropical coral reefs are found around the islands. Fishing activities undertaken by local community members in the Kei islands are artisanal, such that the majority of boats do not have inboard motors, and the common fishing equipment used by local fishers includes lift-nets (*bagan*), drift gill-nets (*jaring insang hanyut*), troll lines (*pancing tonda*), vertical lines (*jaring insang tegak*), hand lines (*pancing ulur*), bottom gill nets (*jaring insang tetap*), encircling gill nets (*jaring insang lingkar*), small-purse seine nets (*pukat cincin*), and fish traps (*bubu*).

2.2. Survey

Face-to-face interviews were conducted in the Kei Islands from November to December 2013. The survey covered four fishing villages in the district of Kei Kecil and 296 households which were randomly selected and surveyed with a structured questionnaire. For each household, the survey targeted the main fisher who spends the most time involved in fishing activity in the household. Prior to the implementation of the survey, we visited the surveyed villages and pre-tested the survey instrument. The interviews were undertaken by local researchers at the University of Pattimura, all of whom attended training and information sessions.

2.3 Econometric methods

Our aim was to assess the factors that are potentially associated with the incidence of conflicts among marine resource users. To achieve this, we estimate the conditional probability that a respondent is involved in a conflict with other resource users, such that:

$$\begin{aligned}\Pr\left[y_i^k = 1 \mid \mathbf{X}_i \right] &= F\left(\mathbf{X}_i^{'}\beta\right) \\ &= F\left(\beta_0 + \mathbf{FA}_i^{'}\beta_{FA} + \mathbf{FC}_i^{'}\beta_{FC} + \mathbf{SR}_i^{'}\beta_{SR} + \mathbf{TF}_i^{'}\beta_{TE} + \mathbf{DMO}_i^{'}\beta_{DMO}\right)\end{aligned} \quad (1)$$

where y_i^k is a binary variable and $k = I$ and O. For example, y_i^I equals one if respondent i indicated that he/she has a conflict with other resource users in the village, and equals zero otherwise. Similarly, y_i^O equals one if respondent i has a conflict outside the village and equals zero otherwise. In the survey, the questions concerning local conflicts were worded as follows:

"Do you have ongoing or past conflicts with other marine resource users in the village? (Yes/ No)"
"Do you have ongoing or past conflicts with other marine resource users in other villages? (Yes/ No)"

We therefore focus on conflict that occurs in local coastal communities among marine resource users, regardless of whether it is violent.[2]

On the right hand side of equation (1), F is a cumulative distribution function taking values between zero and one, and hence the conditional probability on the left hand side of the equation is also bounded between zero and one. We include a matrix of explanatory variables ($\mathbf{X}_i$), each of which is grouped into one of the five categories according to their attributes, namely: fishing activity (**FA**); fishery condition (**FC**); social relationship (**SR**); threats to local fishing activity (**TF**); and demographic characteristics (**DMO**). The parameter β_0 is the intercept and β_{FA}, β_{FC}, β_{SR}, β_{TE}, and β_{DMO} are vectors of the corresponding coefficients of the explanatory variables. It is important to note that most explanatory variables included in equation (1) are likely to be endogenous as the occurrence of conflict among local marine resource users affects various aspects of the fishing activity as well as how each fisher perceives changes in the fishing environment and social relationship in the community. That is to say, the estimated coefficients of the explanatory variables in (1) imply a level of association, rather than causal relationship, with the incidence of local conflicts.

[2] A typology of different types of fishery conflicts was developed by Charles (1992) and revised by Bennett *et al.*(2001). Type of conflicts considered in this paper can be classified as a conjunction of Types III and IV in Bennett et al (2001).

We determine the extent to which each explanatory variable included in equation (1) affects the probability of intra- and inter-village conflict by calculating the marginal effect of changes in an explanatory variable for respondent *i* (ME_i). For continuous explanatory variables, the marginal effect of explanatory variable x_{ij} for respondent *i* is calculated as:

$$ME_i = \frac{\partial \Pr\left[y_i^k = 1 | . \right]}{\partial x_{ij}} = \frac{\partial F(.)}{\partial x_{ij}} \beta_j \tag{2}$$

where β_j is the coefficient of variable x_{ij}. Similarly, for binary explanatory variables, the marginal effect is calculated as:

$$ME_i = F(.)\big|_{x_{ij}=1} - F(.)\big|_{x_{ij}=0} \tag{3}$$

Given the marginal effect for respondent *i*, we can calculate the sample average of the marginal effect as $N^{-1}\sum_i ME_i$ (Cameron & Trivedi, 2005).

To estimate the coefficients in equation (1), we adopt both the probit and logit models, in which the logistic model is specified as $F\left(\mathbf{X}_i'\beta\right) = \exp\left(\mathbf{X}_i'\beta\right) \Big/ \left[1 + \exp\left(\mathbf{X}_i'\beta\right)\right]$ and the probit model is specified as $F\left(\mathbf{X}_i'\beta\right) = \int_{-\infty}^{\mathbf{X}_i'\beta} f(z)dz$ where f is the standard normal density. The two different binary regression models are estimated to assess the robustness of our estimations results against the model specifications. We cluster standard errors by village to control for potential correlation between the respondents in the same village.

3 Results

3.1 Characteristics of surveyed villages

Table 1 reports the descriptive statistics of the dependent and explanatory variables in each group of the five categories. The dependent variable in equation (1) has a binary outcome indicating whether the respondent has a conflict with other marine resource users. In our sample, the proportion of the respondents who indicated that there was a conflict with other resource users in their village is 8.6 percent and outside the village is greater at 28 precent.

[Table 1 about here]

The small-scale fishery in the Kei islands is a multi-species fishery, in which the respondents in our sample caught a total of 23 species in the year 2012/2013. The most common species include small tuna (*komu*), coral cod (*kerapu*), mackerel (*kawalinya*), scad (*momar*), bluefin trevally (*bubara*), ornate emperor (*sikuda*), and anchovy (*puri*). The total volume of fish caught for each fishing trip varies significantly among the fishing operators. The mean and median catch per trip is 1.486 and 0.310 tonnes, respectively. The great dispersion between the mean and median values indicates a positively skewed distribution of total catch per fishing trip. Fish is an important animal protein in the diet and a major source of income in the surveyed villages, and fishing is generally undertaken throughout the year. On average, the respondents are engaged in fishing for six days a week. Around 46 percent of the respondents indicated that they recently changed their main fishing grounds and nearly 75 percent of the respondents indicated that their main fishing grounds are outside the village's sea territory.[3] In the surveyed villages, fishing equipment is often shared within a group or borrowed from other village members. Around half the fishing equipment used in 2012/2013 was not owned by the fishing operators.

Although our respondents are located within a relatively small geographical area and engaged in a similar type of fishing activity, individual fishers have different perceptions of fishery conditions. More than 50 percent of the respondents indicated that the fish stocks in their fishing grounds are decreasing and their catch has declined over time. However, despite the fact that half of the respondents perceived that fishery conditions are declining, around 19 percent of the respondents still reported that their catch and fish stocks in the fishing grounds are increasing. Regarding an individual's social relationships, most respondents maintain a good relationship with the village leader (*kepala desa*), whereas about 35 percent of the respondents indicated that they do not have a good relationship with officers at the district fishery department. In Indonesian waters, there is an increasing number of vessels from outside that are harvesting marine resources both legally and illegally and they are considered to be a potential threat to the health of aquatic ecosystems (Adhuri & Visser, 2007; Resosudarmo et al., 2009). In our sample, around 50 percent of the respondents observed outsiders fishing in their village sea territory at least once a week.

In our survey, the respondents were also asked to indicate whether the potential threats, namely population growth, deforestation of mangroves, aquaculture development, and tourism development, negatively affect their fishing activities. Around 50 percent of the respondents agreed that population growth and aquaculture development are the two biggest threats. The two least threatening factors are the deforestation of mangroves and tourism development with a 39 and 17 percent agreement rate, respectively.

[3] The concept of the sea territory in the Kei islands is discussed by Adhuri (2013).

The average age of the respondents is 38 years old and all except three respondents are male. The average years of formal school education are 8.5 years and more than 90 percent of the respondents completed 5 to 6 years of primary education. Given that we targeted the survey at villages where the main source of livelihood is fishing, all respondents' main occupation is fishing; yet about 75 percent of the respondents also indicated that they have a second job, such as farming crops, cultivating seaweed, raising livestock, and being involved in business services.

3.2 Intra-village conflicts

Table 2 reports the estimation results of equation (1) for the case of intra-village conflicts where a conflict occurs between marine resource users within the same village. The estimation results of the probit and logit models are almost identical, in terms of both the marginal effects as well as the statistical significance, and we interpret the estimation results using the probit model. While the value of the persudo-R^2 is 0.209, the likelihood ratio test (LR = 35.6, $d.f.$ = 22) suggests that the explanatory variables are jointly significant at the 5 percent level and more than 90 percent of the observed dependent variable is correctly predicted by the model. These statistics suggest that the model fits the data relatively well for a binary regression model.

[Table 2 about here]

Our estimation results show that whether a fisher has a conflict with other marine resource users in the village is related to all variables concerning fishery conditions (**FC**) and social relationships (**SR**) at the statistically significant level ($p < 0.05$). Notably, among all explanatory variables included, whether fishers maintain a good relationship with the village leader has the largest marginal effect on the occurrence of intra-village conflicts. More specifically, our estimation results suggest that fishers who have a good relationship with the village leader are on average 13.4 percent less likely to be involved in intra-village conflicts than those who do not. Similarly, fishers who have a good relationship with officers at the district fishery department have a lesser likelihood of being involved in intra-village conflicts than other fishers do.

Our estimation results also show that the incidence of resource conflicts within a village is associated with the individual's perception of changes in fishery conditions. For example, fishers who perceive that the fish stocks in their fishing grounds are depleting are less likely to be involved in a conflict with other resource users in the village. This may reflect the fact that fishers with the perception of declining fish stocks are more likely to cooperate with one another within the village to cope with the environmental degradation. By contrast, fishers who indicated that their catch has increased are 4.7 percent more likely to be involved in intra-village conflicts. Resource conflict within a village is also

more likely to occur among local marine resource users who often observe that outsiders have access to the village sea territory and catch fish.

In contrast to the variables concerning social relationships and fishery conditions, the probability of whether a fisher becomes involved in a conflict within the village is not associated with most variables related to fishing activity (**FA**). The statistically insignificant variables of the fishing activity include the catch per trip, number of fishing days per week, the cost per fishing trip, and fishing location. The two variables that do have a statistically significant relationship ($p < 0.10$) with the occurrence of intra-village conflicts are the number of years the fisher has been fishing in the same village sea territory and the proportion of the fishing equipment owned by the fisher. More specifically, the longer the fisher has been catching fish in the village sea territory, the less likely he is to have a conflict with other marine resource users in the village. Furthermore, the greater the proportion of the fishing equipment owned by the fisher, the less likely it is that a resource conflict within a village will occur.

Among the four variables of threats to local fishing activity (**TF**), population growth and tourism development is associated with a higher level of resource conflicts within a village ($p < 0.05$). For instance, fishers who indicated that population growth negatively affects their fishing activity are 9.5 percent more likely to be involved in a conflict with other resource users in the village. Given limited alternative livelihoods, as observed in other reef fisheries (Joshua E Cinner et al., 2009), population growth may threaten the health of marine resources and increase resource competition among resource users, especially with new participants. The development of local conflicts due to population pressure has long been recognised (Myers, 1987) and has also been reported in other Indonesian fishing communities (Muawanah et al., 2012). It is however important to note that not all external threats to the local fishing activity contribute to the incidence of intra-village conflicts. For example, fishers who perceive that tourism development negatively affects their fishing activity are less likely to be involved in intra-village conflicts. As opposed to population growth, tourism development may yield an opportunity to earn a secondary source of income and may decrease fishery resource conflicts.

3.3 Inter-village conflicts

Table 3 reports the estimation results of equation (1) for the case of resource conflicts between different villages. The estimation results of the probit and logit models are again similar to each other, and we base the interpretation of our estimation results on the probit model. The likelihood ratio test ($LR = 74.2$, $d.f. = 22$) suggests that the explanatory variables are jointly significant at the 1 percent level of significance. Nevertheless, the pseudo-R^2 and the prediction success rate are lower than those for the case of intra-village conflicts in Table 2.

[Table 3 about here]

A major difference between the results for the case of intra- and inter-village conflicts is that all variables concerning fishing activity (**FA**) have a statistically significant effect on the occurrence of resource conflicts between different villages. Notably, fishers whose main fishing area is outside their village sea territory are 20.6 percent more likely to be involved in a conflict with other marine resource users outside their village. Furthermore, fishers who have recently changed the location of their main fishing area are 14.6 percent more likely to have inter-village conflicts. Another fishing activity variable, which has a relatively large marginal effect ($p < 0.05$), is the proportion of fishing equipment owned by the fisher. Similarly to our results for the intra-village conflict, an increase in the private ownership of fishing equipment is associated with a lesser probability of inter-village conflicts. For the other fishing activity variables, we find that, albeit the marginal effects are relatively small, a fisher is more likely to be involved in a conflict with other resource users outside the village if the catch per trip is smaller, the number of days engaged in fishing per week is greater, the cost per trip is greater, and the number of years fishing in the village sea territory is longer.

Similarly to the case of intra-village conflicts, the difference in individuals' perceptions of changes in fishery conditions is also associated with the incidence of inter-village conflicts. Interestingly, however, the coefficients of these variables have an opposite sign from those in the case of intra-village conflicts. For instance, fishers who perceive that the fish stocks in their fishing grounds are decreasing are more likely to be involved in a conflict outside the village. Moreover, fishers who indicated that their catch has increased are less likely to be involved in a conflict with other marine resource users outside their village. Similarly, the variables concerning social relationships with the village leader and district fishery department officers have different results from the case of intra-village conflicts. For instance, in contrast to the case of intra-village conflicts, fishers who have a good relationship with the village leader are 15.4 percent more likely to have a conflict with other resource users outside the village. Furthermore, we find no evidence that having a good relationship with officers at the district fishery department is associated with a lesser probability of inter-village conflicts. These results may reflect the limited capacity of local institutions or the current co-management arrangements in our study site to lessen the conflict between different villages. Previous studies also reported mixed outcomes of co-management arrangements and cases in which the local or centralised management authority struggled to resolve conflicts over resource use in the Kei islands and elsewhere (Adhuri, 2013; Bennett et al., 2001; Cinner et al., 2012; DuBois & Zografos, 2012; Siry, 2011). It is likely that a good working relationship between resource managers and resource users is crucial for successful conflict management; yet not sufficient by itself to alleviate all resource conflicts.

Regarding the variables concerning the threats to local fishing activity (**TF**), only the deforestation of mangroves is related to the occurrence of inter-village conflicts at a statistically significant level, despite the signs of the coefficients being the same as those for the case of intra-village conflict. Fishers who indicated that the deforestation of mangroves negatively affects their fishing activity are on average 11.1 percent more likely to be involved in a conflict with resource users from outside the village. Conversely, we find no evidence that the incidence of inter-village conflicts is related to other threats, including population growth, aquaculture development, and tourism development. Furthermore, while we did not find that a minority ethnic group is more or less likely to be involved in intra-village conflicts than other major ethnic groups, our estimation results for the inter-village conflict suggest that a minority group is less likely to be involved in a conflict with other marine resource users outside the village.

4 Concluding remarks

In this paper, we undertook a survey of small-scale fishing households in the Kei islands of southeast Maluku in Indonesia, and conducted a regression analysis with the collected data to examine the underlying factors that may potentially be associated with the incidence of local resource conflicts. We distinguish conflicts arising within the same village (i.e., intra-village conflicts) and conflicts involving resource users from different villages (i.e., inter-village conflicts). Local conflicts over the use of natural resources can negatively affect the productivity of small-scale fisheries, inhibit the social, economic, and conservation outcomes of fisheries management and threaten livelihoods of the rural coastal communities. It is thus important from both the development and resource management perspective to improve our understanding of the patterns of local conflicts in coastal communities and the link between conflicts and different aspects of small-scale fisheries. This paper also aims to enrich literature on understanding determinants of non-headline local conflicts as there is limited quantitative case studies based on household survey data (Barron et al., 2009).

We consider a number of potential factors associated with the incidence of resource conflicts in local coastal communities, each of which is grouped in one of five categories according to their attributes, namely fishing activity, fishery conditions, social relationships, threat to local fishing activity, and demographic characteristics. We find that the set of factors associated with the incidence of intra-village conflicts is different from that of inter-village conflicts. For instance, individuals' choice of fishing location is associated with conflicts between resource users from different villages, but it does not affect the incidence of resource conflicts within the same village. Similarly, other variables concerning fishing activity, such as the volume of catch and cost per fishing trip are significantly associated with the incidence of inter-village conflicts but not with intra-village conflicts. An exception is the variable concerning the private ownership of fishing equipment. Our regression

results show that an increase in the proportion of fishing equipment owned by a fisher is associated with a lesser probability of both intra- and inter-village conflicts. This result is aligned with previous research, such that the private or community-based ownership of harvesting rights plays a crucial role in determining the outcome of the fishery as well as the development of local fishery conflicts (Adhuri, 2013; Grafton et al., 2006). Our result extends this result, suggesting that increases in the private ownership of fishing equipment may help to decrease the incidence of local conflicts among marine resource users.

Our results further show that, while some of the factors are associated with both intra- and inter-village conflicts, the way in which these factors affects each type of local conflict is different. For instance, fishers who have a good relationship with district fishery department officers are less likely to be involved in a conflict in their village. Contrary to this, however, we find no evidence that fishers who have a good relationship with the department officers are less likely to be involved in a conflict with other resource users from outside their villages. Furthermore, improving a relationship between fishing operators and their village leader by itself may create a trap for coastal communities, by discouraging intra-village conflict while at the same time intensifying inter-village conflict. While social capital, including connections among individuals within a local community, plays a crucial role in the socio-economic performance of fisheries management (Pomeroy & Berkes, 1997), our results suggest that how social relationships work in resolving local conflicts depends on who is involved in the conflict and other characteristics of conflicts that emerge in coastal communities.

We also find that individuals' perception of changes in fishery conditions affects the incidence of intra- and inter-village conflicts differently. For instance, fishers are less likely to be involved in intra-village conflict if they perceive that the fish stocks in their fishing grounds are decreasing over time. By contrast, the likelihood of resource conflicts between different villages increases with the perception of declining fish stocks. Similarly, fishers who indicated that their catch has increased are more likely to be involved in a conflict outside their village, but at the same time, they are less likely to be involved in a conflict within the village. These results suggest that the perception of declining fish stocks may contribute to the development of conflicts between different villages, particularly when the depletion of fish stocks is perceived as a result of the increase in catch by other fishers and this perception of one party gaining at the expense of another party can trigger resource conflicts between resource user groups. However, the perception of declining resources available for exploitation may not always increase competition among resource users, particularly when they are in a cooperative relationship within the same village. This is most likely the case with the small-scale fishing villages in our study site as most fishers indicated that they have a good relationship with other fishers in their village and fishing equipment is often shared by a group or borrowed from other village members.

It is well accepted that marine ecosystems in Indonesian waters are under increasing pressure from human activities and many fish stocks are either fully or over-exploited. In relation to this, there is a growing concern for overinvesting in fishing capacity to compete with other marine resource users as well as for the development of local conflicts over the use of natural resources. While preventing emerging and resolving existing conflict is important, our results overall show that there is no single factor or category of the attributes predominantly related to the incidence of local conflicts in the rural coastal communities in the Kei islands; conversely, different sets of factors jointly explain the variation in local conflicts. Our results further reinforce observations that resource conflicts involve various resource user groups in the local community and the way in which the socio-economic characteristics of the community members relates to each type of conflicts is complicated.

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Tables

Table 1 Descriptive statistics

Variable	Mean	Median	Std. Dev.	Min	Max
***Fishing activity* (FA)**					
Catch per trip (tonnes)	1.486	0.310	2.106	0.011	10.330
Number of days engaged in fishing per week	6.196	6	1.034	1	7
Cost per fishing trip (Rp000000)	0.440	0.170	1.110	0	15.240
Fish within the village sea territory (yes=1, no=0)	0.265	0	0.442	0	1
Fishing area changed (yes=1, no=0)	0.457	0	0.499	0	1
Number of years fishing in the village	13.26	10	9.363	0.2	45
Proportion of fishing gears owned	0.517	0.39	0.413	0	1
***Fishery condition* (FC)**					
Fish stocks increasing (yes=1, no=0)	0.168	0	0.375	0	1
Fish stocks decreasing (yes=1, no=0)	0.540	1	0.499	0	1
Catch increasing (yes=1, no=0)	0.192	0	0.395	0	1
Catch decreasing (yes=1, no=0)	0.533	1	0.500	0	1
Observed outsiders fishing in the village sea territory (yes=1, no=0)	0.474	0	0.500	0	1
***Social relationship* (SR)**					
Relationship with village leader (good=1, not good=0)	0.986	1	0.117	0	1
Relationship with fishery department officers (good=1, not good=0)	0.639	1	0.481	0	1
***Threat to local fishing activity* (TF)**					
Population growth (yes=1, no=0)	0.498	0	0.501	0	1
Deforestation (yes=1, no=0)	0.388	0	0.488	0	1
Aquaculture (yes=1, no=0)	0.467	0	0.500	0	1
Tourism (yes=1, no=0)	0.172	0	0.378	0	1
***Demographic* (DMO)**					
Age	38.13	35	12.25	17	80
Number of years of school education	8.488	9	3.015	0	17
Have a second occupation (yes=1, no=0)	0.749	1	0.434	0	1
Number of household members	5.608	5	2.463	0	16
Ethnic group other than Kei and Buton (yes=1, no=0)	0.107	0	0.309	0	1
Dependent variable					
Conflict with other marine resource users in the village (yes=1, no=0)	0.086	0	0.281	0	1
Conflict with other marine resource users in other villages (yes=1, no=0)	0.282	0	0.451	0	1

Table 2 Regression results: intra-village conflict

	Probit			Logit		
Variable	Coefficient	Marginal effect	p-value	Coefficient	Marginal effect	p-value
***Fishing activity* (FA)**						
Catch per trip (tonnes)	0.052	0.7%	0.267	0.095	0.6%	0.331
Number of days engaged in fishing per week	0.018	0.2%	0.924	0.089	0.6%	0.845
Cost per fishing trip (Rp000000)	-0.069	-0.9%	0.125	-0.109	-0.7%	0.163
Fish within the village sea territory (yes=1, no=0)	-0.036	-0.4%	0.686	-0.149	-1.0%	0.621
Fishing area changed (yes=1, no=0)	0.225	2.8%	0.319	0.379	2.5%	0.316
Number of years fishing in the village	-0.018	-0.2%	0.072 *	-0.033	-0.2%	0.097 *
Proportion of fishing gears owned	-0.300	-3.8%	0.014 **	-0.501	-3.3%	0.025 **
***Fishery condition* (FC)**						
Fish stocks decreasing (yes=1, no=0)	-0.123	-1.5%	0.030 **	-0.319	-2.1%	0.002 ***
Catch increasing (yes=1, no=0)	0.336	4.7%	0.025 **	0.645	4.8%	0.057 *
Observed outsiders fishing in the village sea territory (yes=1, no=0)	0.529	6.5%	0.000 ***	1.018	6.5%	0.000 ***
***Social relationship* (SR)**						
Relationship with village leader (good=1, not good=0)	-0.739	-13.4%	0.000 ***	-1.250	-11.8%	0.000 ***
Relationship with fishery department officers (good=1, not good=0)	-0.232	-3.0%	0.000 ***	-0.507	-3.4%	0.000 ***
***Threat to local fishing activity* (TF)**						
Population growth (yes=1, no=0)	0.780	9.5%	0.014 **	1.517	9.6%	0.004 ***
Deforestation (yes=1, no=0)	0.145	1.8%	0.385	0.272	1.8%	0.419
Aquaculture (yes=1, no=0)	0.249	3.1%	0.466	0.308	2.0%	0.687
Tourism (yes=1, no=0)	-0.526	-5.6%	0.007 ***	-0.976	-5.5%	0.003 ***
***Demographic* (DMO)**						
Age	0.005	0.1%	0.404	0.006	0.0%	0.499
Number of years of school education	0.009	0.1%	0.688	0.022	0.1%	0.708
Have a second occupation (yes=1, no=0)	0.342	4.0%	0.145	0.709	4.3%	0.083 *
Number of household members	0.113	1.4%	0.000 ***	0.220	1.4%	0.000 ***
Ethnic group other than Kei and Buton (yes=1, no=0)	0.036	0.5%	0.935	0.208	1.4%	0.829
Constant	-2.185		0.005 ***	-4.359		0.033 **
Log-likelihood	-67.437			-67.565		
McFadden's Pseudo-R^2	0.209			0.208		
Likelihood ratio statstic for the joint significance of the model	35.637**			35.381**		
Percent predicted correctly	91.41%			91.41%		
Number of observations	291			291		

Note: Standard errors are clustered by village. *** 1% level, ** 5% level, and * 10% level.

Table 3 Regression results: inter-village conflict

	Probit			Logit		
Variable	Coefficient	Marginal effect	p-value	Coefficient	Marginal effect	p-value
***Fishing activity* (FA)**						
Catch per trip (tonnes)	-0.116	-3.1%	0.000 ***	-0.205	-3.1%	0.001 ***
Number of days engaged in fishing per week	0.181	4.8%	0.071 *	0.303	4.6%	0.047 **
Cost per fishing trip (Rp000000)	0.087	2.3%	0.004 ***	0.148	2.3%	0.000 ***
Fish within the village sea territory (yes=1, no=0)	-0.856	-20.6%	0.000 ***	-1.473	-20.3%	0.000 ***
Fishing area changed (yes=1, no=0)	0.541	14.6%	0.000 ***	0.998	15.6%	0.001 ***
Number of years fishing in the village	0.020	0.5%	0.000 ***	0.038	0.6%	0.000 ***
Proportion of fishing gears owned	-0.517	-13.6%	0.022 **	-0.906	-13.8%	0.024 **
***Fishery condition* (FC)**						
Fish stocks decreasing (yes=1, no=0)	0.200	5.3%	0.002 ***	0.249	3.8%	0.065 *
Catch increasing (yes=1, no=0)	-0.840	-19.4%	0.000 ***	-1.457	-19.2%	0.000 ***
Observed outsiders fishing in the village sea territory (yes=1, no=0)	-0.176	-4.6%	0.148	-0.330	-5.0%	0.069 *
***Social relationship* (SR)**						
Relationship with village leader (good=1, not good=0)	0.712	15.4%	0.000 ***	1.172	14.7%	0.001 ***
Relationship with fishery department officers (good=1, not good=0)	-0.144	-3.8%	0.729	-0.300	-4.7%	0.698
***Threat to local fishing activity* (TF)**						
Population growth (yes=1, no=0)	0.112	3.0%	0.523	0.191	2.9%	0.499
Deforestation (yes=1, no=0)	0.410	11.1%	0.066 *	0.726	11.5%	0.070 *
Aquaculture (yes=1, no=0)	0.293	7.8%	0.358	0.473	7.3%	0.394
Tourism (yes=1, no=0)	-0.925	-21.0%	0.231	-1.658	-21.4%	0.288
***Demographic* (DMO)**						
Age	0.003	0.1%	0.374	0.005	0.1%	0.078 *
Number of years of school education	0.007	0.2%	0.730	0.023	0.4%	0.539
Have a second occupation (yes=1, no=0)	0.129	3.4%	0.096 *	0.193	2.9%	0.145
Number of household members	0.022	0.6%	0.461	0.043	0.6%	0.425
Ethnic group other than Kei and Buton (yes=1, no=0)	-0.293	-7.3%	0.000 ***	-0.473	-6.8%	0.024 **
Constant	-2.653		0.007 ***	-4.523		0.001 ***
Log-likelihood	-135.946			-135.707		
McFadden's Pseudo-R^2	0.214			0.216		
Likelihood ratio statstic for the joint significance of the model	74.183***			74.662***		
Percent predicted correctly	75.95%			76.63%		
Number of observations	291			291		

Note: Standard errors are clustered by village. *** 1% level, ** 5% level, and * 10% level.

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