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1 **TITLE: Food and water insecurity in specialised fishing communities: evidence from**
2 **the Philippines**

3 **ABSTRACT**

4 Food insecurity remains a problem for Southeast Asian communities that specialise in
5 fishing. Food insecurity is closely linked to other social conditions, and the linkages between
6 these conditions and their underlying drivers are less well explored in fishing contexts than
7 they are in agricultural contexts. In this paper I draw on fieldwork from a community that
8 specialises in fishing in the Western Philippines to examine the linkages between food and
9 water insecurity. Food insecurity is common, and characterised by a lack of funds to buy
10 food, particularly during periods of bad weather. Water insecurity is also characterised by the
11 need to pay for the delivery of drinking water from one of several remote sources. I argue that
12 both food and water insecurity in communities that specialise in fishing are driven by broader
13 forms of poverty. Understanding the relations between food and water insecurity and the
14 wider drivers of poverty should generate better understandings of how food and water
15 insecurity is generated and reproduced in specialised fishing community contexts.

16 **KEYWORDS:**

17 **1. INTRODUCTION**

18 The relationship between fisheries and food security is becoming a field of rapidly growing
19 academic and policy interest. From an environmental perspective, some have emphasised the
20 dangers to food security from overfishing, and the potential food security gains from
21 increasing the availability of fish through well-managed fisheries and protected areas (Pauly
22 et al., 2005; Mora et al., 2009; Foale et al., 2013). The food security benefits of fish are also
23 being heavily promoted from a human health and nutritional perspective (Béné et al., 2015;
24 Golden et al., 2016). It is increasingly recognised in the marine policy community that food

25 security is not just about increasing the availability of fish, but instead is a highly complex
26 condition, influenced by multiple factors including trade and market dynamics, nutrition,
27 gender, and other social relations (Loring et al., 2013; Fiorella et al., 2014; McClanahan et
28 al., 2015; Béné et al., 2016; Golden et al., 2017). In this paper the focus is on the linkages
29 between household food insecurity and the related problem of water insecurity, and how both
30 are collectively driven by poverty. The ways in which food insecurity is linked to other
31 problems such as water insecurity, and the broader drivers of these conditions, are less well
32 explored in specialised fishing community contexts than they are for related issues in
33 agricultural contexts. Drawing on extensive fieldwork from the coastal Philippines, the focus
34 in this paper is on understanding how poverty contributes to the linked experiences of food
35 and water insecurity.

36 Linkages between food insecurity and other problems are well-recognised, for example the
37 linkages between food insecurity and HIV/AIDS (Himmelgreen et al., 2009). Social scientists
38 have more recently begun to explore the linkages between food and water insecurity, with
39 some calling for a broader study of ‘resource insecurity’ that examines how humans meet
40 their ‘basic needs’ for food and water (Wutich and Brewis, 2014). While less studied than the
41 more well-known concept of food security¹, water security refers to

42 the ability to access and benefit from affordable, adequate, reliable, and safe water for
43 wellbeing and a healthy life. Water insecurity is a condition when at least one of these
44 variables (affordability, reliability, adequacy, and safety) is significantly reduced or
45 unattainable so as to threaten or jeopardize wellbeing, which includes, but is not

¹ A common definition of food security is ‘availability and adequate access at all times to sufficient, safe, nutritious food to maintain a healthy and active life’ (World Food Programme, 2015). In this and other similar definitions, food security is not simply understood in terms of ‘availability’ of food, but also ‘access’ and ‘use’ (and sometimes ‘stability’).

46 limited, to physical and mental health and the capacity to undertake necessary
47 productive, social, and cultural activities (Jepson et al., 2017: 3).

48 The highly diverse and rapidly growing literature on water insecurity has examined water
49 security in the context of a variety of concepts and themes, including: human needs and
50 development; ecological sustainability; geopolitics and international relations; and
51 vulnerability and adaptation (Jepson et al., 2017: 3; see also Hadley and Wutich, 2009; Cook
52 and Bakker, 2012; Lankford et al., 2013).

53 Yet in the marine policy community, discussion of water insecurity is scant relative to similar
54 research on food insecurity. While this may be because the linkages between food insecurity
55 and fisheries are more direct and obvious (fish as a source of food itself and as a product that
56 can be sold to purchase other foods), in this paper I aim to show how water insecurity is also
57 worthy of study because of the ways through which it is closely linked to food insecurity in
58 specialised fishing community contexts, and how it highlights the common drivers of both.
59 Food and water insecurity have often been observed to co-occur in many cases (Wutich and
60 Brewis, 2014), and this is also likely to be the case in specialised fishing community contexts
61 beyond those described in this paper. Small islands, for example, represent an example where
62 households may frequently specialise in fishing, and experience both food and water
63 insecurity (Macintyre, 1983; Lane et al., 2013; Hadwen et al., 2015). At an empirical level,
64 therefore, the aim of the paper is to assess and describe some of the ways in which food and
65 water insecurity relate to each other in specialised fishing community contexts.

66 At a conceptual level, linkages between food insecurity and other problems – such as water
67 insecurity – are commonly conceived to be components of a broader social state, or as
68 manifestations of an underlying driver. Scholars writing with very different theoretical
69 orientations – from those studying vulnerability and multiple stressors (Adger, 2006; Bennett

70 et al., 2015), to political ecology studies emphasising the drivers of poverty at multiple scales
71 (Bohle et al., 1994), to biomedical studies of ‘structural violence’ (Farmer, 2004) and
72 ‘syndemics’ (Himmelgreen et al., 2009; Singer et al., 2017) – have all emphasised how food
73 insecurity is heavily influenced by more fundamental forces. In their development of the
74 notion of ‘resource insecurity’, Wutich and Brewis (2014) follow Sen (1981) to emphasise
75 the role of a lack of entitlements in generating food and water insecurity. However, in
76 comments on this review, other authors have noted the potential for future studies to instead
77 examine the role of markets and poverty in generating food and water insecurity (Logan,
78 2014; Stevenson and Hadley, 2014).

79 In this paper I will show how food and water insecurity in communities that specialise in
80 fishing are both generated by poverty (poverty understood in a very narrow sense as
81 constituted by a low level of financial assets and income). I show that both food and water
82 security depend strongly on income, and those periods when it is most difficult to obtain
83 money are when food and water insecurity occurs. I focus on the role of income in food and
84 water insecurity because of the particular importance of markets for specialised fishing
85 communities. As Firth noted in his study of Malay peasant fishing communities from 1944,
86 unlike many mixed farmer-fishers, full-time fishers need to be able to sell their fish:

87 The agriculturalist’s main crop is usually also his staple food, but the fisherman does
88 not mainly live on fish. He must also have rice or similar vegetable food as his staple.
89 Hence for him exchange of his product, or part-time agriculture, is a necessity; full-
90 time fishing, therefore, tends to be more definitely associated with an exchange
91 economy than does full-time agriculture (Firth, 1966 [1944]: 27).

92 Similarly, in a review of the history of Philippine capture fisheries, Spoehr pointed out that
93 ‘[c]ontemporary Southeast Asian communities specialised in fishing are primarily dependent

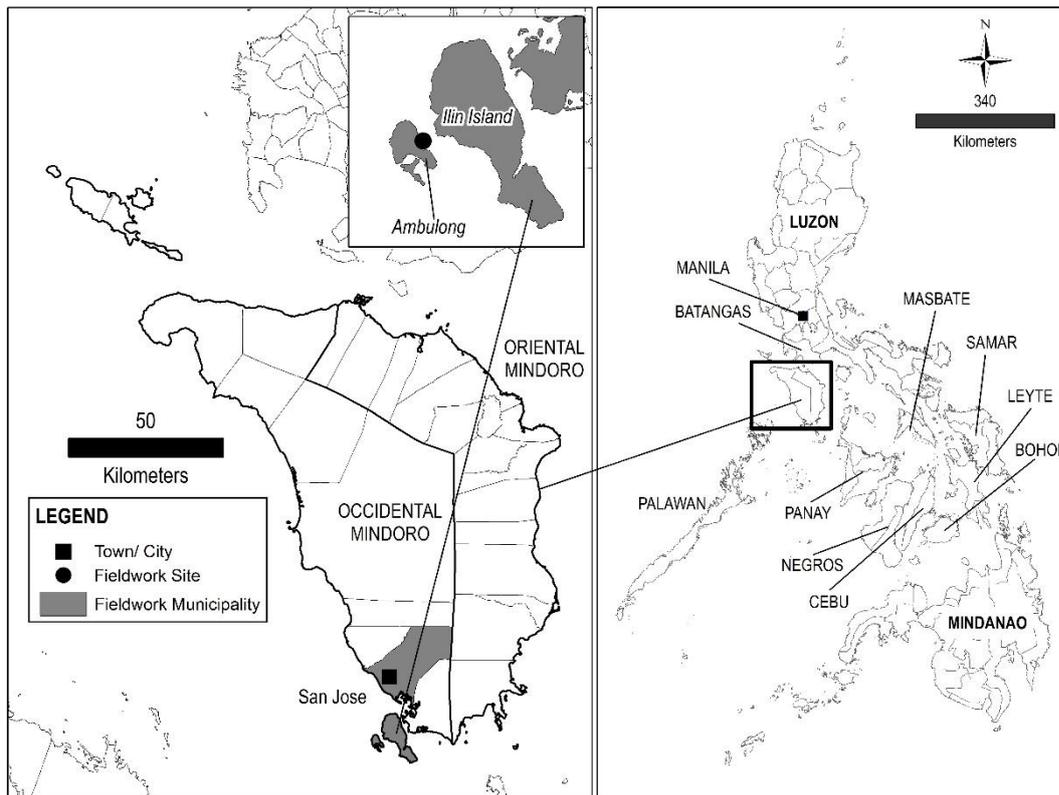
94 on town, city or regional markets... Communities specialised in fishing are not economically
95 self-sufficient and depend on markets external to the community' (Spoehr, 1984: 26-27; see
96 also Siar, 2003). While these insights regarding the importance of markets for communities
97 that specialise in fishing have been present in the anthropological literature for many years,
98 much research and policy on food security for fishing communities (particularly from a
99 conservation perspective) still tends to downplay the role of trade and markets, focusing
100 instead on the availability of marine resources (Foale et al., 2013; Fabinyi et al., 2017). In the
101 discussion, I expand on the ways in which studies of food and water insecurity could be
102 usefully complemented by political economy work on a 'relational' view of poverty (Mosse,
103 2010) that focuses on the broader relations that sustain poverty, and consequently food and
104 water insecurity.

105

106 **2. MATERIALS AND METHODS**

107 The island of Ambulong is part of the municipality of San Jose, which is located in the
108 province of Occidental Mindoro (Figure 1) and has a population of 143,430. While Mindoro
109 is a significant centre for agricultural production, San Jose is also an important centre for
110 commercial² fishing, with 121 commercial fishing vessels registered there. Major types of
111 commercial fishing vessels based in San Jose include bagnet vessels that target small pelagic
112 fish (e.g. scad, *Decapterus* spp), hook and line vessels (carrying multiple small boats) that
113 target mixed reef fish, large net fishing vessels that target all fish (*lintigan*), and vessels that
114 carry spearfishers, who dive using hoses and air compressors.

² In the Philippines, commercial fishing vessels are defined as those >3 gross tons, and are only allowed to fish in waters 15km from the shoreline.



115

116 **Figure 1: Map of study site.**

117 Ambulong is a small island of 1033 ha, lying approximately 15km from San Jose town, with
 118 a population of 3525 (508 households). Residents are composed of migrants from different
 119 parts of the Philippines who arrived and settled the island in the early twentieth century.

120 Fishing is the dominant livelihood; there are very limited viable alternative livelihoods on the
 121 island. Seaweed farming is practiced by some households as an additional, supplemental
 122 source of income, some rice and vegetables are farmed in the interior of the island, and
 123 bamboo is harvested and sold. There are also some remittances from younger residents who
 124 increasingly look for work in San Jose town (e.g. commercial fishing vessels), elsewhere on
 125 the mainland of Mindoro (e.g. agricultural labouring on tobacco and onion farms), or in
 126 Manila. However, the limited availability of suitable farmland on this small island means that
 127 most residents are full-time small-scale fishers, meaning that Ambulong is an ideal location
 128 to study food and water insecurity in communities that specialise in fishing. As with many

129 communities of the Philippines that specialise in fishing, fishers resident in Ambulong
130 practice a wide range of fishing activities to catch a diversity of species in different seasons.
131 At the lowest level of capitalisation are fishers who use boats with no engine and simple
132 gears (e.g. hook and line) to catch very small numbers (e.g. <10kg/day) of assorted reef fish.
133 However, the most common type of fishing involves boats with engines with crew of two to
134 four people who use bottom-set gillnets to target fish such as sardines (*Sardinella*), fusiliers
135 (*Caesio* spp), and rabbitfish (Siganidae). Others use driftnets to target larger fish such as
136 garfish (*Belone belone*). Most of these types of fish only fetch a price of between P20-P50/kg
137 when sold in San Jose town. Spearfishing and gleaning are also common, and fishers will
138 occasionally catch small quantities of higher-value species such as octopus, lobster, squid,
139 and groupers. These products are also traded locally to San Jose town. Some younger men
140 (approx. 20) are employed on the large-scale commercial hook and line vessels that operate
141 out of San Jose town or from neighbouring Palawan province. Fishing activities are flexible,
142 and vary throughout the year depending on season, weather, household financial
143 circumstances, and personal preferences.

144 This paper draws on data from a mixed-methods approach that took place over three fieldtrips
145 to Ambulong in August 2014, March 2016, and June 2017. I worked with the largest
146 community in Ambulong, which is administratively divided into two *sitios* and three *puroks*,
147 but which forms one geographical community of 348 households, with a population of 2465,
148 along the eastern coast of the island, and which is locally referred to (and hereafter in this
149 paper) as ‘Ambulong’. In 2014 and 2016, fieldwork centred around semi-structured
150 interviews with residents in Ambulong (n=30), one focus group with elderly residents that
151 focused on historical settlement and livelihood change, and three semi-structured interviews
152 with key informants in San Jose town (government officials from the Bureau of Fisheries and
153 Aquatic Resources and the fishport, and a commercial fishing captain). These semi-structured

154 interviews and the focus group discussion were supplemented with numerous unstructured
155 interviews and observations of livelihood activities in Ambulong. The topics for these
156 interviews in 2014 and 2016 in Ambulong focused on life histories of individuals and
157 households, community patterns of marine resource use and trade and livelihood change over
158 time, and contemporary possession of assets, livelihood strategies, and social differentiation
159 within Ambulong. Income class was not explicitly considered as a discrete variable in these
160 interviews; instead, poverty was described through descriptions of experiences, household
161 assets, and fish catches. Households were selected based on the snowball method to
162 encompass a range of different livelihood activities (e.g. different fishing methods).

163 In 2017, fieldwork was specifically focused on obtaining data about food and water insecurity
164 in Ambulong. Seventy semi-structured interviews were undertaken, with questions focusing
165 on food and water insecurity, food and water consumption patterns, and adaptations to food
166 and water insecurity. Female household heads were targeted as household members with a
167 high knowledge of household food and water insecurity. A female research assistant from the
168 local community assisted with these interviews. Interviewees were selected through
169 purposive sampling to include households of different types of fishing gears. As part of these
170 interviews, formal assessments of food and water insecurity were also undertaken. The
171 Household Food Insecurity Access Scale (HFIAS) (Coates et al., 2007) includes a range of
172 questions about the subjective experience of food insecurity over the past four weeks, and is
173 widely used among development practitioners and scholars as one measure of food
174 insecurity. For each of the nine questions about experiences of food insecurity, the women
175 gave a score of 0-3 to indicate the frequency of occurrence. The Household Water Insecurity
176 Access Scale (HWIAS), more recently developed by Tsai et al., (2016), is based on the
177 HFIAS, and asks a series of questions about the subjective experience of water insecurity
178 over the past four weeks (see Jepson et al., 2017 for a list of other metrics of household water

179 insecurity). Both the HFIAS and HWIAS were translated into Tagalog, and questions were
180 adapted to local conditions.

181 Four key informant interviews were also conducted with local leaders and health workers in
182 the community, focusing on community engagement with non-governmental organisations
183 (NGOs) and government policies and projects for food and water insecurity. Observations
184 were also undertaken of food and water procurement and preparation, and livelihood
185 activities such as fishing and seaweed farming. Numerous unstructured interviews on these
186 topics with male fishers (ranging from short conversations to extended discussions of an hour
187 or more) were also undertaken.

188 Developing methods for the measurement of both food (Barrett et al., 2010) and water
189 (Jepson et al., 2017) insecurity has been a goal of researchers and practitioners in these fields
190 for years. Both the HFIAS and the HWIAS have multiple limitations. They rely on
191 participant recall over the past few weeks, and they are subjective: some women may see
192 having to use water from a spring as a problem, for example, while others do not. Others may
193 have been ashamed to discuss their experiences with food and water insecurity with an
194 outsider. Because both measures are a static snapshot of the past four weeks, they can also
195 provide highly variable results according to season. These measures are therefore not
196 intended as a comprehensive assessment of food or water insecurity. Instead, they provide
197 one measure of food and water insecurity that contextualises, supplements, or ‘triangulates’
198 (Flick, 2014) the main data collection on these topics generated by qualitative semi-structured
199 and unstructured interviewing, and by observations. The focus is therefore less on the
200 quantitative assessments of food and water insecurity as it is on the qualitative details.

201 All interviews were conducted in Tagalog, which is the national *lingua franca* and spoken by
202 community members. Informed consent was obtained from all participants. Detailed

203 fieldnotes were taken each day during fieldwork, and these fieldnotes were subsequently
204 manually qualitatively analysed for key themes that emerged (Bernard, 2006). Statistics on
205 fisheries were also obtained from relevant government offices. The paper also draws on
206 insights from long-term ethnographic research in other parts of the coastal Philippines,
207 mostly in neighbouring Palawan province (e.g. Author, 2012).

208 **3. RESULTS**

209 As almost all households rely on small-scale fishing as their primary income source, there is
210 only limited social differentiation in Ambulong. One-hundred and eighty-eight out of 508
211 households (37%) on the island overall are beneficiaries of the government's conditional cash
212 transfer program, which is designed to provide social assistance and break 'poverty cycles'
213 (Philippine Government, 2017). Because this program is only designed for very poor
214 households, the high proportion of beneficiaries is an indication of the very high level of
215 poverty on the island. However, ownership of fishing assets is one form of differentiation
216 among households. Those who own a boat accrue a greater share of the profits than
217 crewmembers, and they can rent their boat out while they work on other income-generating
218 activities. For example, a net fishing trip typically involves three to four crew: at the end of
219 the trip profits are divided among each fisher, and the boat owner also gets a share. Other
220 boat owners rent their boat out at PHP³50 a day. Other more well-off households include
221 those who had household members sending remittances from their work in San Jose town or
222 elsewhere, while some households owned land and collected rent. In contrast, poorer
223 households are those without significant financial assets, whose income is effectively
224 determined by how much fish they catch on a day-to-day basis. Their livelihoods are less
225 secure because they depend on the schedules and needs of other boat owners to work on their
226 boats, and they obtain less income than boat owners because their profit shares from each

³ During the last period of fieldwork in May-June 2017, USD1 = PHP49.

227 fishing trip are lower. According to the national statistical agency, ‘During the first semester
228 of 2015, a family of five needed at least PhP 6,365 on the average every month to meet the
229 family’s basic food needs [i.e. the ‘food threshold’] and at least PhP 9,140 on the average
230 every month to meet both basic food and non-food needs [i.e. the ‘poverty threshold’]. While
231 income data was not formally collected, households such as those without significant fishing
232 assets reported earning well under PHP10,000 gross income per month. Such households find
233 it difficult to effectively save money and consequently, they are impacted most severely when
234 bad weather interrupts daily fishing activities.

235

236 **3.1 Food consumption and insecurity**

237 The diet in Ambulong is similar to that of many other parts of the coastal Philippines, and is
238 based around the consumption of rice and a dish, or viand (*ulam*). There is some rice grown
239 in the interior of Ambulong, but this covers only a small amount of the consumption needs of
240 Ambulong residents. Therefore, rice is almost always bought, costing between PHP35-50/kg
241 and transported from San Jose town. Rice consumption forms a significant component of
242 weekly household budgets, and rice is eaten at every meal. Some small swidden vegetable
243 plots in the interior of Ambulong exist, but these do not supply enough vegetables for annual
244 consumption. Vegetables are therefore also commonly bought by residents.

245 The most commonly eaten viand is fish, which is generally procured from a household’s own
246 catch. Higher-value species of fish are invariably transported to San Jose and sold, while a
247 portion of the lower-value species are consumed. This means that the fish that are regularly
248 consumed are those that are regularly caught in Ambulong (Table 1). As sardines are the
249 most commonly caught fish, they are eaten almost every day by many residents. When fish
250 are bought by residents, the price for most fish sold in Ambulong is between PHP20-50.

251 Meats such as chicken (PHP120), pork (PHP130) and beef (PHP180-200) are rarely eaten
252 because of their price.

253

254 **Table 1: Commonly caught and consumed fish in Ambulong**

255

Common English name	Local name	Scientific name
Sardines	Tamban	<i>Sardinella</i>
Emperors	Kanuping	<i>Lethrinidae</i>
Garfish	Katsawan	<i>Belone</i>
Mackerel/tuna	Tulingan	Scombridae
Parrotfish	Mulmol	Scaridae
Rabbitfish	Samaral, Danggit	Siganidae
Flying fish	Flying fish	Exocoetidae

256

257 Experiences of food insecurity are common among households in Ambulong. For the HFIAS,
258 out of a total possible score of 27, where 27 represents the highest degree of food insecurity,
259 and 0 the lowest, the mean response was 7.9 (n=70, s=6.4). There are many ways in which
260 respondents described food insecurity via their coping mechanisms. (Table 2).

261 **Table 2: Types of food insecurity and coping mechanisms**

262

Food insecurity	Coping mechanisms
Not enough rice to eat	Reduce portion size and meal frequency
	Buy cheaper root crops
	Borrow from neighbours/kin
No fish or side dish	Use sauces/condiments
	Borrow from neighbours/kin

263

264 Households will frequently reduce their food consumption, for example, eating once or twice
 265 a day: people will skip breakfast, or combine breakfast and lunch into a late morning meal
 266 and then eat nothing until dinner. On occasions, women described how they or their spouse
 267 would only eat once a day. Across many households the stated priority was for children to
 268 have sufficient food; the male household head and sometimes the female household head
 269 sometimes went without food or minimised their food consumption specifically in order for
 270 the children to have enough to eat. Dinner is the meal that all respondents will aim to
 271 consume because of the uncomfortable feeling associated with being hungry while going to
 272 sleep: ‘even if we skip breakfast and lunch, we make sure to eat something before going to
 273 sleep’ one woman noted. Food choices are very limited, as the following quotes from women
 274 indicate:

275 ‘We have no choice, whatever is there we just eat it.’

276 ‘Having food is more important than variety, we just eat whatever we can get.’

277 If people do not have access to a viand, they will adapt: people will make rice porridge to
278 make it more filling (*lugaw*), reduce the amount of viand they consume (e.g. spreading 0.5kg
279 of fish for the whole family over a whole day), or add mixtures of sugar, coffee, oil, and soy
280 sauce as ‘viands’. However, it is very difficult when rice is unavailable, as one respondent
281 noted: ‘the most important thing is rice – as long as we have rice we are OK’. This is because
282 rice is perceived to be filling, and it provides the foundation for what is locally understood to
283 be a ‘proper’ meal. When households cannot afford to buy rice, people will sometimes
284 instead consume root crops (e.g. cassava, sweet potato) that are grown locally in swidden
285 plots and sold more cheaply than rice (PHP20/kg), or breadfruit. Others will go into debt,
286 borrowing money from kin, friends, or neighbours. Because of the importance of rice for
287 food security, and the fact that rice needs to be bought, food security is therefore largely
288 equated with income in the views of many residents.

289 Fish are also extremely important for food security in Ambulong. Not only are they the main
290 type of viand, because fishing is the primary livelihood activity on the island, they (more
291 significantly) provide the income that is used to buy rice, other viands, such as vegetables,
292 and sauces, coffee, sugar and salt. After the fish for household consumption is deducted from
293 the catch (a few kgs, depending on the size of the family), the rest is sold. However, the
294 capacity of fishing to sustainably generate food security for households in Ambulong appears
295 to be at risk. Among the fishers and female household heads interviewed, many gave
296 examples of reduced catches. One net fisher gave the example that during the 2000s, he could
297 easily catch up to 200kg during peak season, but now would catch 100-150kg. Another stated
298 that during the 1990s, he could catch well over 300kg; now, he would bring in a maximum of
299 75kg. Similarly, a hook and line fisher noted that in the 1990s, he used to be able to catch up
300 to 25kg, whereas now he regularly caught between 2-10kg. According to long-term residents,
301 population growth since the 1970s greatly increased the number of fishers in the local area.

302 At different times, destructive and illegal fishing methods have been widely practiced in the
303 area, including the use of sodium cyanide, dynamite, and commercial-scale fishing (*lintigan*)
304 in local municipal waters. Official statistics from the municipal office of the Department of
305 Agriculture state that daily fish catch rates for motorized boats in Ambulong are now from 5-
306 10kg (lean season) and 10-30kg (peak season). Declining fisheries and limited alternative
307 livelihood options for local residents therefore mean that food security is negatively affected
308 at a community level.

309 However, local health workers also reported some progress on food security issues. An
310 international NGO began working in Ambulong in 2008, with a focus on improving the
311 quality of life of children. Many children who were most at risk of food insecurity were
312 sponsored. Additionally, a feeding program implemented by the provincial government since
313 2011 targeted those children with malnutrition, employing local health workers to prepare
314 meals for specific children. According to local government data, malnutrition among children
315 aged 0-71 months in Ambulong has declined, from 38% in 2011, down to 24% in 2013, and
316 11% in 2017. While food insecurity therefore remains present in Ambulong, targeted
317 government interventions appear to have had some impact.

318 **3.2 Water use and insecurity**

319 For water for washing, people will use water from one of ten wells that exist in the
320 community. These are all open, public, dug wells that are located within 50-100m from the
321 shoreline. Most residents live within just a couple of minutes' walk from one of these wells,
322 and so will fetch water as needed several times a day. While this water is brackish and
323 unsuitable for drinking, it is not generally perceived to be a problem for washing clothes and
324 dishes, as well as personal hygiene. Some more well-off households have a personal pump
325 inside their homes, connected to the well water.

326 There has never been a source of water for drinking and cooking in Ambulong, and so
 327 residents need to obtain this water from one of three external sources. The first source is from
 328 a spring on the western side of Ambulong Island, which takes approximately half an hour to
 329 get to by boat. The second source is a spring on Ilin Island, directly opposite the community,
 330 which takes a similar amount of time to get to (both are two to three km away). Some
 331 residents obtain water from a third source, purified water from San Jose town.

332 There are several problems associated with water insecurity with these sources (Table 3). For
 333 the HWIAS, out of a total possible score of 24, where 24 represents the highest degree of
 334 water insecurity and 0 the lowest, the mean response was 6.9 (n=70, s=7.2). For the springs,
 335 water is fetched using large containers of between 20-30L. Those residents who own a boat
 336 can go directly themselves to fetch water. The cost of such a trip will be approximately
 337 PHP55, for a litre of fuel to be used. More often, however, residents will pay someone to
 338 deliver water. Water deliverers will collect water containers from many residents at a time
 339 and fetch water, using either a boat with an engine or a raft made from bamboo. These are
 340 usually young men in the community, who make multiple trips a day. Waiting time at both
 341 springs varies significantly, but can sometimes be up to two hours. A container costs between
 342 PHP12-17 (depending on the size) to be filled with water and delivered. Depending on the
 343 size of the household, households will fill between one to two containers at a time, two to
 344 four times per week. This means the weekly cost of water delivery is between PHP60-120 per
 345 week for most households.

346 **Table 3: Types of water insecurity and coping mechanisms**

Water insecurity	Coping mechanisms
Not enough water for drinking and cooking	Ration drinking water

	Borrow from neighbours/kin
Water is dirty/unsafe	Buy filtered water from town
	Boil water from springs and wells

347

348 People often use different water sources depending on their needs and at different times of
349 the year. Water from town is the most expensive, at PHP25 for a 30L container, so more
350 well-off households that can afford it use this water. This water is also perceived to be the
351 safest for drinking. However, most residents use water from either of the two springs for
352 drinking, most of the time. At certain times of the year, the water from the springs is
353 perceived to be dirty or less safe for drinking. This occurs both during the dry season
354 (December-May), and at times during the rainy season (June-November). Sometimes leaves
355 and dirt wash into the spring, algae appears, or the water tastes saltier than other times. At
356 these times when the water from the springs is less safe, or if they can afford it, some
357 residents who normally drink from the springs will choose to buy it from town: ‘if we have
358 money we buy it from town, if not then we just get it from the spring’ noted one woman.
359 Another explained how ‘we just use this [mineral water from town] for the children’s
360 drinking water, we [parents] will drink from the spring’. Similarly, one woman noted how ‘if
361 the water isn’t very clean, we just use the spring water for cooking, and we drink the water
362 that we buy from town’. Some will boil the water during times when the water is perceived to
363 be less safe, others will boil it consistently, and others will rarely or never boil it. As safe
364 water becomes more difficult to obtain, therefore, decisions about which water source to use
365 for which activity become more finely-grained, depending on specific household financial
366 circumstances, the different priorities assigned to children and adults, and the different levels
367 of perceived risk in using spring water for cooking as opposed to drinking.

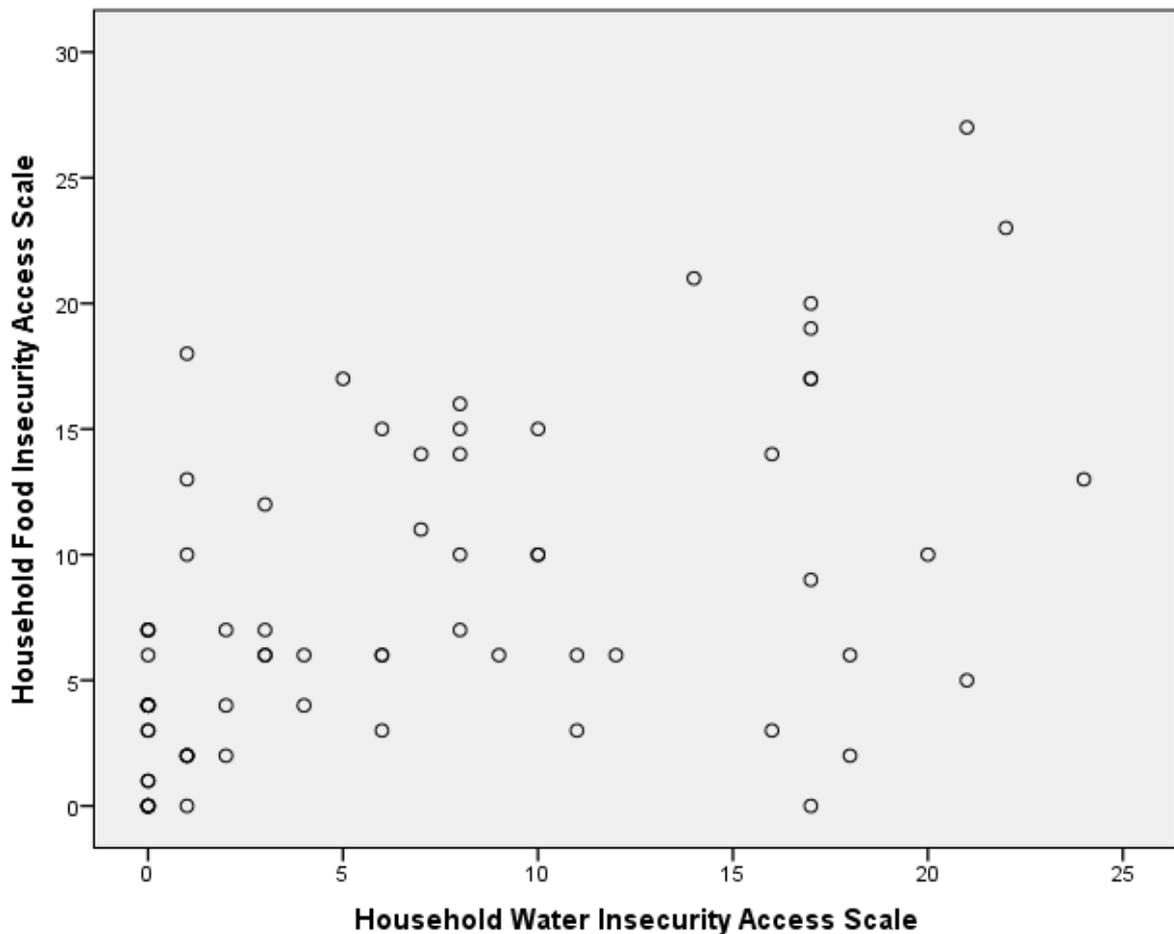
368 During periods of bad weather, it becomes difficult to collect water, because the weather
369 conditions make it dangerous for small boats and rafts to travel by sea. In these periods some
370 households pay more to buy it directly from town (the bigger passenger boats that travel
371 between Ambulong and San Jose town can often still travel at these times). Others buy water
372 from neighbours who have spare water available, which is priced at the same level as if it
373 were delivered from the springs; others will use water from the local wells and simply boil it;
374 while others will also collect rainwater using buckets and ice boxes. Some women perceive
375 drinking water from the springs to be a cause of diarrhoea, citing examples where they
376 believed cases among children to be caused by drinking water from the springs. As with food,
377 during periods of limited water availability within the household, women reported decreasing
378 water consumption among parents of a household explicitly so that children would have
379 enough to drink. Several men and women described how they would specifically ration their
380 drinking water (e.g. 8 cups a day) to conserve it. In Ambulong, therefore, water insecurity has
381 multiple dimensions: because water needs to be purchased it is sometimes unaffordable,
382 which can sometimes lead to inadequate water intake, while at certain times of the year the
383 weather also makes water unsafe.

384 As with food, there have also been several external initiatives designed to reduce water
385 insecurity on Ambulong. The external NGO that arranged for the sponsoring of children also
386 had attempted to build a piping system from the spring on Ambulong Island to the eastern
387 side of the island where the community was located. A dispute, however, centred on the
388 financial arrangement with the landowner of the spring. Currently, the owner collects 1-
389 1.50PHP for each container filled at this spring, depending on the size. The NGO and the
390 landowner were unable to agree on management and financial arrangements for the proposed
391 piping system, so the system remained undeveloped.

392 **3.3. Linkages between food and water insecurity**

393 To what extent and in what ways are food and water insecurity linked in Ambulong? Using
394 the scores from the HFIAS and HWIAS, it is possible to do a simple correlation test.
395 Pearson's r was computed to assess the relationship between the reported scores for the
396 HFIAS and the HWIAS. There was a strong positive correlation between the HFIAS and
397 HWIAS scores, $r=.535$, $n=70$, $p<0.001$. A scatterplot summarises the results (Figure 2).
398 This shows that food and water insecurity (as measured by the HFIAS and HWIAS) are
399 correlated: those who experience food insecurity are also more likely to experience water
400 insecurity.

401



402

403

404 **Figure 2: Relationship between HFIAS and HWIAS (n= 70).**

405 Disentangling the linkages between food and water insecurity is difficult because of the ways
 406 they are both inextricably linked with other components of ‘the assets (natural, physical,
 407 human, financial and social capital), the activities, and the access to these’ that comprise a
 408 livelihood (Ellis, 2000: 10). The interconnected nature of food insecurity, water insecurity
 409 and other stressors is illustrated in female household perceptions of daily stresses (Table 4).

410 **Table 4: Daily family stresses in Ambulong (n=70).**

411

Stress name	Number of times ranked 1 (n=70)	Number of times mentioned overall (n=70)
Financial problems	18	37
Sickness	14	34
Food	11	23
Water	6	17
Expenses for children (tuition fees, allowance, etc.)	6	13
Bad weather	5	15
Alcohol/vices	4	10
Other	6	14

412

413 Women were asked to list in order all the ‘daily stresses for their family’. Their responses
 414 highlight the significance of food and water insecurity, as well as the ways that they are

415 intricately connected with other concerns. Both food and water are directly listed (food as the
416 third-ranked stress and water as the fourth), and are closely linked to all the other concerns
417 listed. Women attributed various types of sickness (the second-ranked stress), for example, to
418 problems with the water. When asked if the water from the springs was safe to drink,
419 residents frequently noted how they ‘couldn’t be sure’, and that at certain times of the year it
420 clearly wasn’t. The spring water was cited by women as a cause behind diarrhoea, especially
421 that of children. One woman whose husband had kidney stones ascribed this to the reduced
422 water consumption he had had in the weeks leading up to the sickness, while another woman
423 noted the high number of urinary tract infections in the community, and also ascribed this to
424 insufficient hydration. A lack of food is also commonly perceived to lead to sickness. For
425 example, people described how they had to eat not just because they were hungry, but so they
426 didn’t get weak and sick, which would then lead to greater problems. When sick, household
427 members cannot go out to fetch water, cannot go out fishing, and cannot effectively
428 contribute to the running of the household. This leads to a loss of income, exacerbating food
429 and water insecurity.

430 Similarly, obtaining both food and water takes significant amounts of time. For those who
431 fetch drinking water from the springs themselves, time is spent travelling to the spring,
432 queuing, fetching the water, and then returning. Those who have their water delivered spend
433 less personal time, but still need to wait for deliveries, which are often late. Fetching water
434 for washing from the wells does not usually take more than a few minutes, but is still longer
435 than those residents who own a personal pump in their own household. This time spent
436 fetching water is time that could otherwise be put towards fishing or other income-generating
437 activities. As one resident complained: ‘You feel like you want to go to work, but you still
438 have to go and fetch water first’. Obtaining food also requires a greater amount of time than
439 previously, because of declining fisheries. A fishing trip that may have taken only several

440 hours to bring in 10kg or so, for example, now may take most of the day. Greater time spent
441 fishing means less time available to fetch water, and reduced incomes from fishing means
442 less money available to buy both food and water.

443 As the highest-ranked stress, financial problems underlie the experiences of food and water
444 insecurity in Ambulong. Daily gross income for poorer households, for example, is highly
445 variable, but can be between PHP200-1200 per day depending on the season and catch, after
446 fish are sold at the San Jose market. Fuel costs can be several hundred pesos, depending on
447 how far the boat goes, and there are also costs of transporting the fish to San Jose town (less
448 than PHP100).

449 Drinking water must be bought either from the springs or from town, and as one respondent
450 described, this is an expense (of PHP60-120 per week) that cannot be avoided: 'Before you
451 make your budget for the week, you always have to have water. You can't go without water.
452 We sacrifice other things before water.' Another pointed out the perceived injustice of the
453 situation: 'Actually water should be free, but we have to pay for it'⁴. Food – rice, in particular
454 – forms another significant expense. As households will consume approximately 2.5kg of rice
455 per day, this means that up to PHP125 can be spent on rice daily. While fish, the primary type
456 of viand, are almost entirely derived from peoples' own fish catch, rice is bought by all
457 households on Ambulong. This means that, especially after operating costs such as fuel and
458 transportation are taken into account, a large proportion of the gross income of households is
459 spent on food and water.

460 The fact that water and food therefore form a significant component of household budgets
461 means that they can compete with each other. More money that is spent on water means less

⁴ Such a comment is reminiscent of Susan George's observation that 'Food *ought* to be a basic human right. However, this right cannot be exercised in a system that divides people into two categories: those who can pay (called 'consumers') and those who cannot (1985: 4, emphasis in original).

462 money that is available to buy food, and vice versa. In times of low income – during bad
463 weather when fishers cannot go out to sea – water and/or food consumption can be reduced
464 because of a lack of funds to buy adequate amounts of both. In addition to the examples given
465 in section 3.1, the centrality of income to food and water insecurity is highlighted by the
466 following quotes from women:

467 ‘We want to eat things other than fish, but we can’t afford it.’

468 ‘If we had money we would like to eat groupers, but we eat sardines every day instead!’

469 ‘We want to eat meat but we can’t afford it... We only have just enough food to get through
470 each day.’

471 Income is central to both food and water security. Rice, the foundation of food security in the
472 view of local residents, needs to be bought. When money is difficult to access because of bad
473 weather that prevents people from going fishing, or for other reasons, the ability to buy rice
474 declines. This is the same for other types of food such as vegetables and meat, and also for
475 water. Those who are more food secure and those who are more water secure are those who
476 can buy food and water more easily. Given the reports of declining catches at a local level in
477 Ambulong (and the widespread definitive occurrence of this at a national level [Anticimara
478 and Go, 2016]), it seems likely that food and water insecurity may become even more
479 challenging in the future.

480

481 **4. DISCUSSION**

482 This paper has assessed the linkages between food and water insecurity in a community that
483 specialises in fishing in the Philippines. Making strong claims about these linkages is difficult
484 because of the malleability of the concepts of food and water insecurity, the difficulty of

485 measuring them both, the complexity of the factors that drive them both, and the limited
486 inferences that can be drawn from a case study of just one community. Yet there is evidence
487 from this study that is relevant for understanding patterns of food and water insecurity in
488 other specialised fishing communities, for the development of policy interventions, and for
489 understanding how poverty is perpetuated and sustained in such contexts.

490 While the important links between fisheries and food security have become the focus of many
491 studies (see e.g. Béné et al., 2016), recognition of how water insecurity affects food security
492 in fishing contexts remains scant. This paper has therefore aimed to provide a first step to
493 account for some of the ways in which food security and water security relate to each other in
494 communities that specialise in fishing. I have aimed to show how the costs of food and water
495 insecurity reinforce each other in a synergistic way (Singer et al., 2017), collectively driven
496 by poverty. The centrality of markets in specialised fishing communities means that poverty
497 plays a major role in determining food and water insecurity.

498 Considering the synergies between food and water insecurity highlights ways in which policy
499 interventions could potentially target both. For example, interventions to alleviate water
500 insecurity at the community level (e.g. a piping system from a spring) could indirectly
501 alleviate household food insecurity through reducing the expenses of residents⁵.

502 Correspondingly, interventions to improve the income of fishing households, such as
503 improved post-harvest facilities (e.g. dryers), or in the long-term, improved fisheries
504 management, could also improve water security through improving purchasing power.

505 However, it remains difficult to envisage simple, straightforward solutions to the problems of
506 poverty that generate food and water insecurity. Tourism and aquaculture, for example, are
507 two widely touted ‘alternative livelihood’ activities touted for specialised fishing

⁵ Although see (Gibson and Mace, 2006; Stevenson and Hadley, 2014) about unintended negative consequences of some interventions to improve water security.

508 communities across Southeast Asia, yet both livelihood activities also come with potential
509 negative impacts (e.g. marginalisation of coastal residents without secure tenure) and
510 vulnerabilities (e.g. to disease, weather, price, and economic shocks), and their effectiveness
511 can be highly geographically variable (Fabinyi, 2010; Cabral and Aliño, 2011; BFAR, 2016).
512 Government cash transfers currently play a crucial role in supporting poorer households, but
513 their long-term effectiveness in generating wealth is questionable. What may become more
514 common in future years may instead be increased migration from coastal areas, as younger
515 people keen to find more income look to urban centres and away from fishing for work
516 (Fabinyi, 2012; Rigg et al. 2012).

517 More broadly, then, highlighting the linkages between food and water insecurity also shows
518 the need to go beyond specific technical policy interventions and to address the wider
519 political and economic drivers of poverty in such contexts (Li, 2007). When trying to trace
520 such drivers, helpful here is political economy work on a ‘relational’ view of poverty
521 (Harriss, 2007; Mosse, 2007, 2011; Bernstein, 2010). In contrast to much poverty research
522 that focuses on the measurement of poverty and the impact of technical interventions, a
523 relational view of poverty emphasises the ways that poverty can only be understood in
524 relation to the broader conditions that allow it to flourish, such as particular forms of agrarian
525 change. A relational view of poverty is ‘one that first views persistent poverty as the
526 consequence of historically developed economic and political relations, and second, that
527 emphasises poverty and inequality as an effect of social categorisation and identity’ (Mosse,
528 2007: 1156). Poverty, from this perspective is viewed as emerging from processes of
529 capitalist accumulation (e.g. dispossession for ‘primitive accumulation’, unequal trade
530 relations)⁶, and reinforced by social institutions such as ethnicity, gender, and so on (e.g.

⁶ As Harriss notes: ‘The wealth of some is causally linked to the crushing poverty of others’ (2007: 12).

531 Haller and Merten, 2008). From this perspective, understanding the precise nature of poverty
532 is less valuable on its own than understanding the relationships that reproduce it.

533 While beyond the scope of this study, much can be gleaned from other studies of coastal
534 livelihoods in the Philippines that show how poverty in the coastal zone is generated and
535 reproduced (e.g. Knudsen, 2016). In many cases, fishers in the Philippines have been
536 ‘adversely incorporated’ into capitalist relations, for example through patron-client relations
537 that allow traders to obtain higher shares of the profits of internationally-traded seafood than
538 fishers (Cruz-Trinidad et al., 2014). Examples of ‘coastal grabbing’ related to rapidly
539 escalating coastal land values for tourism development have also placed pressures on
540 marginalised fishing households, who often have no formal land tenure (Fabinyi, 2010;
541 Cabral and Aliño, 2011; Dressler, 2011; Knudsen, 2012). Overfishing remains prevalent
542 throughout the country (Anticamara and Go, 2016). And in response to declining fisheries,
543 the government has been expanding forms of maritime governance such as marine protected
544 areas, often reducing access to fishing grounds for fishers with significant consequential
545 social impacts (Segi, 2014). These large-scale political and economic trends converge and
546 interact with locally-specific sets of social relationships on the ground (e.g. class, ethnicity,
547 old and new migrants), privileging some groups and marginalising others (Knudsen, 2012;
548 Segi, 2014). Future research in contexts of communities that specialise in fishing could
549 productively aim at understanding the relations between food and water insecurity and such
550 broader structures: the specific pathways through which they produce food and water
551 insecurity, and how they condition the prospects for interventions that aim to reduce food and
552 water insecurity.

553

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