

Fish Behavioural Communications Skills Need of Farmers for Profitable Fish Production in Akwa Ibom State

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Abstract

This study determined fish behavioural communication skills need of farmers for profitable fish production in Akwa Ibom State. The descriptive survey design was used for the study. Five specific objectives, research questions and hypotheses respectively guided the study. Two hundred and thirty-nine (239) registered fish farmers and fifty-three (53) fish extension agents formed the population of the study. The sample size of 292 respondents comprising 239 registered farmers and 53 extension agents were used in the study. The instruments used for data collection was a structured questionnaire titled "Fish Behavioural Communication Skills Need of Farmers Questionnaire" (FBCSNFQ) and Fish Behavioural Communication Preferred Skills of Farmers Questionnaire (FIBCPSFQ). The two instrument were necessary to establish the need gap in the study. The instruments were face validated by three experts, two from the Department of Agricultural Education and one from the Department of Guidance and Counselling unit Educational foundation in the university of Uyo. The reliability of the instrument was obtained using the Cronbach Alpha Technique and the result yielded a reliability co-efficient of 0.82. Mean and improvement need index (INI) were used in answering the research questions while the hypotheses were tested using the t-test analysis. The findings of the study among others showed that fish aggression behavioural communication skills and fish erratic swimming behavioural skills are needed by farmers for profitable fish production in Akwa Ibom State. Also, there was a significant different in the mean response between fish farmers and extension agents on fish behavioural communication skills need of farmer for profitable fish production in Akwa Ibom State. It was therefore recommended among others that the department of fisheries, ministry of Agriculture, Akwa Ibom State should integrate the identification of fish behavioural communication skills into their vocational trainings programmes in other to educate both fish farmers and extension agents to ensure profitable fish production in the state. Also, Agricultural Education Department in higher institution in the state should include fish behavioural communication skills in their curriculum to ensure that students can acquire relevant knowledge and skills in detecting fish behavioural communication.

Keywords: Behavioural, Communication, Fish, Needs, Profitability

Introduction

Fish farming is the manipulation of water bodies to achieve desired results in growing of fish to marketable size from a given volume body of water within the shortest possible time and at least cost. It involves keeping fish in captivity, feeding to grow to

maturity and desired size for sale or consumption. Sambo *et al.*, (2021) states that fish farming is a branch of aquaculture which involves the domestication, rearing and harvesting of different types of fish in a well-planned and controlled environment.

In Nigeria fish plays a crucial role in bridging the protein demand supply gap which improves rural livelihood and Fish farming is widely seen as an important weapon in the fight against malnutrition because It provides a good source of essential nutrients, which are especially important for the human growth and well-being. Fish farming also provides food, employment opportunities and income to farmers. In view of the numerous benefits in fish farming, it is pertinent to ensure that relevant fish farming management skills such as fish behavioural communication skills are practiced by fish farmers.

Udoh *et al.* (2023) observed that a great number of the people of Akwalbom are into fish farming enterprise and majority of the farmers have little or no knowledge that fish communicates through body language when faced with challenges to draw the attention of farmers for timely response. Fish farmers in the state who are the managers of fish production rely on local knowledge, peer learning and informal experiences to interpret fish behaviour and provide feedback this means that early warning signs are sometimes overlooked or misinterpreted resulting in delayed corrective measure. Extension workers play a complementary role in bridging the gap between observation and action and providing technical advice that can improve farmer's ability to understand and interpret fish behavioural communication for timely response. Fish behavioural communications as observed by Johnson *et al.*, (2021) are ways fish interact and convey information to farmers. Although fish do not communicate verbally like humans, fish rely on several behaviours to interact with the environment and communicate to farmers which include various body postures to alert the farmers on things happenings within and around the water environment. Fish uses behavioural cues such as body movement, fin displays, rubbing or nudging each other, hiding, erratic swimming, fin flaring, aggression, and water surface breathing, reduced feeding response among others as means of communication to the farmers especially when the water environment is not conducive.

Skills need in fish behavioural communications is the farmer's field practices in handling fish communicated challenges to ensure safety. A farmer understanding of fish behavioural communication enhances fish growth, minimizes stress and optimizes environmental conditions for fish productivity. Udoh, (2012) opined that fish behavioural communication are manifested when faced with challenges such as; water pollution, underfeeding, overstocking, insecurity, delayed sorting, overdue harvesting, disease outbreaks, fish mortality, fish poaching, among others which trigger behavioural communication such as surface breathing, reduced feeding response, aggression, hiding and erratic swimming. In Akwa Ibom State, which has the ultimate goal is to improve fish farm for profitable production, one of the management strategies for profitability is understanding fish behavioural communication. The communication enables farmers to respond to fish needs timely so as to arrest uncertainty. Hence a study on fish behavioural communication skills need of farmers becomes imperative. The specific behavioural

communication skills need of farmers for profitable fish production focused skills need are fish aggression behavioural communication skills need for profitable fish production and fish erratic swimming behavioural communication skills need for profitable fish production in Akwa Ibom State.

Fish aggression behavioural communication refers to a set of confrontational behaviours used by fish to establish dominance, defend territories and reduce competition. signs of fish aggression include, biting, chasing of smaller fish by more dominant ones, fin flaring, body posturing, fish hiding to avoid attack, mouth fighting between fish, cannibalism, wounds and scars on body of fish, missing and damaged body parts among others Johnson *et al.*, (2021). In pisciculture, aggression in fish can reduce fish welfare, cause injuries, reduce growth through stress and mortality. Aggression in fish is not uniform but is influenced by many external and internal factors which include, Overcrowding, poor water quality, hypoxia, parasitic infestation, underfeeding, photoperiod exposures, growth variation among others. Smith *et al.*, (2020), observed that poor water quality causes irritability as a result of low oxygen, this is because under hypoxia condition oxygen rich areas like near water surface or inflows become limited and valuable territories and dominant fish may defend these spots leading to territorial aggression. Smith further stated that aggressive behaviour is linked to toxins such as heavy metals, pesticides and other agricultural runoffs that interfere with neurotransmitters system in fish leading to severe altered social interactions like hyperactivity and aggression as fish fight or flight responses are triggered by increased stress levels.

Erratic swimming behaviour in fish are the uncoordinated movements such as darting, spiraling or swimming upside down that the fish exhibits in response to stressors like poor water quality, low oxygen, overcrowding, parasitic infestation among others in the aquatic environment, Li et al (2023). Erratic swimming behaviour in fish is an important concern in pisciculture because it is usually an early indicator of underlying health issues in the fish farm. Several behavioural signs that are indicative of fish erratic swimming include: uncoordinated movements of fish often displayed as sudden jerky movements, swimming in circles without apparent purpose, darting across pond, surface skimming near water surface, rapid twitching motions that could suggest parasitic infestations, damage fins from collision with pond walls, fish ignoring feed, visible mucus on fish skin.

Fish swimming upside-down, on their sides, or in vertical orientations are clearly experiencing discomfort. Soler, cerda *et al.* (2021) explained that the effects of toxic exposure like ammonia can interfere with function of swim bladder leading to buoyancy disorders, swim bladder dysfunction, neurological damage, and severe osmoregulatory stress all produce equilibrium loss. The progression from normal swimming to subtle balance problems to complete loss of control provides information about fish health and ultimately impaired buoyancy due to acute toxicant exposure often produces rapid equilibrium loss, whilst chronic conditions like nutritional deficiencies produce gradual

swimming abnormalities developing over weeks. Fish farms where fish are left beyond their intended harvest period, providing adequate space and hiding spots can alleviate stress by giving fish opportunities to establish territories, reduce competition and stimulate forage behavior that helps maintain the natural behavior of fish even when kept in a confined space for longer than planned. Keeping records and data analysis are essential for fish farmers, particularly when faced with the challenge of fish erratic swimming. Keeping accurate records of fish growth, health behaviour and water quality allows the fish farmers to track the triggers of fish frantic swimming and make informed decisions about effective management response.

Statement of the Problem

Fish farming is a vital sector which contributes significantly to the economic growth and development of the society. Specifically, fish farming addresses food insecurity, reducing unemployment, contributing to individual and family income generation. Akwalbom State is a maritime state, blessed with three major hydrographic features Cross River, Qua Iboe and Imo River. The abundant water resources support production fish farming.

The enticing benefits of fish farming couple with the naturally endowed and aquatic environment has encouraged and motivated the people of Akwalbom into fish farming. In the state fish farming is widely practiced ranging from individual, families, groups and organisations. This includes youths, civil servant, retirees, schools, churches, cooperatives among others. Preliminary survey by the researcher revealed that a great number of the individuals and groups who are into fish farming have little or no knowledge and understanding that fish communicates by displaying of certain behavioural cues to attracts the attention of the farmers for a particular need. The fish communication is in line with the understanding that all living organism communicate either verbally or behaviourally. Fish exhibit behavioural signs that communicate to the farmer when there is need. Fish behaviour such as erratic swimming, surface gulping reduced feeding, clustering at corners, aggression, prompt hiding are all forms of communication. A farmer requires the skills need to observe, understand interpret and response promptly to the need of fish at a given time to avert prolong challenges and mortality. It is against this background that the research is designed to determine fish behavioural communication skills need of farmer for profitable fish production in Akwalbom State.

Purpose of the Study

The purpose of the study was to determine fish behavioural communication skills need of farmers for profitable fish production in Akwalbom State. Specifically, the study sought to determine fish;

- i. Aggression behavioural communication skills need of farmers for profitable production in Akwalbom State.

- ii. Erratic swimming behavioural communication skills need of farmers for profitable production in Akwalbom State.

Research Questions

The following research questions guided the study;

- i. What are the fish aggression behavioural communication skills need of farmers for profitable fish production in Akwalbom State?
- ii. What are the fish erratic swimming behavioural communication skills need of farmers for profitable fish production in Akwalbom State?

Research Hypotheses

The following null hypotheses were tested at 0.05 alpha level of significance

H₀₁: There is no significant difference in the mean rating of farmers and extension agents on fish aggression behavioural communication skills need of farmers for profitable fish production in Akwalbom State.

H₀₂: There is no significant difference in the mean rating of farmers and extension agents on fish erratic swimming behavioural communication skills of farmers for profitable fish production in Akwalbom State.

Methodology

The study adopted descriptive survey design, The study was carried out in Akwa Ibom State. The population of the study was made up of 575 registered fish farmers and 62 extension agents all from the Department of fisheries, Ministry of Agriculture, Uyo. The sample of the study was 239 registered fish farmers which were selected for the study. 2 local government areas were purposively selected from each of the three senatorial districts of the state, making a total of six local government areas used for the study. The purposive selection was to ensure adequate sample size for the study and allowed the researcher choose local government areas where fish farming activities actually thrive. The 53 fish extension agents were all from the department of fisheries, Ministry of Agriculture. Sample Distribution of Registered Fish Farmers for the Study shows that (Eket Senatorial District - Eket 31, MkpattEnin, 9) (Uyo Senatorial District, Uyo-100, Itu 30) (Ikot Ekpene Senatorial District - Ikot Ekpene-34, Essien Udim, 35)

Two instruments for data collection were questionnaires designed by the researcher and titled "Fish behavioural communication skills need questionnaire" (FIBCNFQ) which elicited information from registered fish farmers and "Fish behavioural communication preferred skills need of farmers for profitable fish production questionnaire" (FIBCPSPFQ), which elicited information from extension agents. The two instruments were needed so as to establish the need gap in the study. The questionnaire was designed on a four-point rating scale of very high need (VLN) high need (HN) low need (LN) very low need (VLN) and very high preferred (VHP) very preferred (VP) low preferred (LP) very low preferred (VLP) with scores 4,3,2,1 respectively.

The validated instrument was administered to 30 respondents that were not part of the sample, but part of the population of the study. Data was collected and analyzed using

Cronbach Alpha statistics. The analysis yielded a reliability index of 0.82 which was considered reliable. The data for this study was collected using direct contact approach with the help of two research assistants who were instructed on how to administer on their meeting days. The data collected was analyzed using mean and Improvement Need Index (INI) to answer the research questions. The mean of preferred skills represented by (XP) was subtracted by the mean of skills need represented by (Xn) to obtained the need gap (Xp-Xn). The (INI) was determined using the formula:

$Xp - Xn$ to rank which skills required the most attention.

Xp

According to Evans *et al*, (20224), mean and improvement need index is most suitable when a gap between need level and performance level is to be established, Evans continued that: (i) Where the value of the need gap (NG) has a positive value (+) it was indicated that there is skill need for farmers because the level at which the skill is needed is higher than the level at which the skill is performed. (ii) A negative (-) difference value implied that there is no skill need for farmers because the level at which the farmers performed the skill is higher than the level at which it is needed. (iii) Zero (0) indicated that there is no skill need because the level at which the skill is performed is the same as the level to which the farmers need the skills.

Decision Rule

Range	Level of Improvement	Interpretation
0.75-1.00	Very high need	Farmers need skills at very high level
0.50-0.74	High need	Farmers need skills at high level
0.25-0.49	Low need	Farmers need skills at low level
0.00-0.24	Very Low need	Farmers need skills at very low level

Where value ≤ 0 indicated or no negative (-). There was no improvement need because INI is intended to measure how much improvement is needed and not how much farmers are exceeding expectations. In testing the null hypotheses, the probability value (p value) was compared with 0.05 level of significant. When p- value was less than or equal to 0.05, the null hypotheses was rejected. On the other hand, when the p- value was greater than 0.05, the null hypotheses was accepted.

Results

The results of the study were presented in the following tables:

Research Question 1: What are the fish aggression behavioural communication skills need of farmers for profitable fish production in Akwalbom State?

Table 1: Results of farmers skills need gap response analysis between farmers and extension agents on fish aggression behavioural communication skills need of farmers for profitable fish production in Akwalbom State

SN	Selected variables	Xp	Xn	NG (xp-xn)	INI $\frac{xp - xn}{3}$	Remarks
1	Wound on the skin	4.00	3.28	0.72	0.24	VLN
2	Fin flaring	3.83	3.74	0.09	0.03	VLN
3	Chasing of smaller fish by bigger fish	3.92	3.78	0.14	0.05	VLN
4	Nipping	3.85	3.56	0.29	0.10	VLN
5	Mouth fighting by fish	3.74	3.52	0.22	0.07	VLN
6	Jaw locking by fish	4.00	1.84	2.16	0.72	HN
7	Territorial defense among	4.00	2.56	1.44	0.48	LN
8	fish	3.40	3.75	-0.35	-0.12	NN
9	Fish darting around without direction	2.89	3.50	0.61	0.20	NN
10	Increased frequency of collusion among fish in pond	3.85	3.56	0.29	0.10	VLN
	Feed Monopolisation by fish					

N = 292, Xn= Mean of Need, Xp= Mean for Preferred, NG = Need Gap Value, INI=Improvement need index (Source: Field Survey, 2024)

Table 1 revealed that 1 item indicated high need (HN), 1 item indicated low need, 6 items indicated very low need (VLN) while 2 items indicated no skills need on fish behavioural communications skills need. The implication of this is that jaw locking by fish indicated high need (HN), territorial defence among fish indicated low need (LN), wounds on fish skin, fin flaring, chasing of smaller fish by bigger fish, nipping, mouth fighting by fish and feed monopolization by fish indicated very low need (VLN) while fish darting around without direction and increased frequency of collision among fish in pond indicated no skill need (NN).

Research Question 2: What are the fish Erratic Swimming behavioural communication skills need of farmers for profitable fish production in Akwalbom State?

Table 2: Results of farmer's skills need gap response analysis between farmers and extension agents on fish erratic swimming behavioural communication skills need of farmers for profitable fish production in Akwalbom State

SN	Selected variables	Xp	Xn	NG (xp-xn)	INI	Remark
1	Uncoordinated movements of fish	3.92	3.78	0.14	0.05	VLN
2	Fish darting suddenly across the pond	3.85	2.12	1.73	0.58	HN
3	Fish spiraling movement to show stress	2.72	3.50	-0.78	-0.26	NN
4	Fish frequently bumping into pond walls	3.92	3.78	0.14	0.05	VLN
5	Abrupt stops and start by fish while swimming	3.00	3.72	-0.72	-0.24	NN
6	Fish breakaway from normal group pattern	3.25	3.75	-0.50	-0.17	NN
7	Fish frequently surfacing without feeding motivation	3.92	2.34	1.58	0.53	HN
8	Damaged fin from colliding with pond walls	3.92	2.34	1.58	0.53	HN
9	Visible mucus excess on the body which is common in parasitic	3.85	2.12	1.73	0.58	HN
10	Fish ignoring feed due to disorientation	3.77	1.90	1.87	0.62	HN

N = 292, Xn= Mean of Need, Xp= Mean for Preferred, NG = Need Gap Value, INI=Improvement need index (Source: Field Survey, 2024)

Table 2 revealed that 5 items indicated high need (HN), 1 item indicated low need (LN), 1 item indicated very low need (VLN) while 3 items indicated (NN). The implication of this is that fish darting suddenly across the pond, fish frequently surfacing without feeding motivation, damaged fish fin from colliding with pond walls, visible excess mucus on the fish body and fish ignoring feed due to disorientation indicated high need (HN), uncoordinated movement of fish and fish frequently bumping into pond walls indicated very low need (VLN) while fish spiraling movement to show distress, abrupt stops and starts by fish while swimming and fish breaking away from normal group pattern indicated no need (NN).

Research Hypothesis 1: What are the fish aggression behavioural communication skills need of farmers for profitable fish production in Akwalbom State?

Table 3: Results of Independent t-test Analysis showing difference in the mean rating of fish farmers and extension agents in fish aggression behavioural communication skills need of farmers for profitable fish production in Akwalbom State

S/N	Selected variables	Xp	Xn	NG (xp-xn)	t- value	p - value	Remark
1	Wound on the skin	4.00	3.28	0.72	2.34	0.02	Sig
2	Fin flaring	3.83	3.74	0.09	2.42	0.04	Sig
3	Chasing of smaller fish by bigger fish	3.92	3.78	0.14	1.18	0.04	Sig
4	Nipping	3.85	3.56	0.29	1.06	0.02	Sig
5	Mouth fighting by fish	3.74	3.52	0.22	1.50	0.08	Sig
6	Jaw locking by fish	4.00	1.84	2.16	1.14	0.06	Sig
7	Territorial defense among fish	4.00	2.56	1.44	2.39	0.01	Sig
8	Fish darting around without direction	3.40	3.75	-0.35	3.27	0.02	Sig
9	Increased frequency of collusion among fish in pond	2.89	3.50	-0.61	1.01	0.31	Sig
10	Feed Monopolisation by fish	3.85	3.56	0.29	0.18	0.86	not sig

The result in Table 4 revealed that out of the ten items assessed, nine items (Items 1,2,3,4,5,6,7,8 and 9) yielded statistically significant differences with p-values less than the alpha level of 0.05. Conversely, the remaining item (Item 10) showed no statistically significant differences, as evidenced by p-values exceeding 0.05. This implies that the research hypothesis three was rejected, hence there is significant difference in the mean response of fish farmers and extension workers on fish aggression behavioural communication skills need of farmers for profitable fish production in Akwalbom State.

Research Hypothesis 2: What are the fish Erratic Swimming behavioural communication skills need of farmers for profitable fish production in Akwalbom State?

Table 4: Results of Independent t-test Analysis showing difference in the mean rating of fish farmers and extension agents in fish erratic swimming behavioural communication skills need of farmers for profitable fish production in Akwalbom State

SN	Selected variables	Xp	Xn	NG (xp-xn)	t- value	p -value	Remark
1	Uncoordinated movements of fish	3.92	3.78	0.14	0.20	0.008	Sig
2	Fish darting suddenly across the pond	3.85	2.12	1.73	0.64	0.042	Sig
3	Spiraling movement to show stress	2.72	3.50	-0.78	0.44	0.006	Sig
4	Fish frequently bumping into pond walls	3.92	3.78	0.14	0.13	0.009	Sig
5	Abrupt stops and start by fish while swimming	3.00	3.72	-0.72	0.58	0.025	Sig
6	Fish breakaway from normal group pattern	3.25	3.75	-0.50	3.20	0.52	not sig
7	Fish frequently surfacing without feeding motivation	3.92	2.34	1.58	0.18	0.006	Sig
8	Damaged fin from colliding with pond walls	3.92	2.34	1.58	0.49	0.02	Sig
9	Visible mucus excess on the body which is common in parasitic	3.85	2.12	1.73	0.69	0.059	not sig
10	Fish ignoring feed due to disorientation	3.77	1.90	1.87	1.09	0.062	Not sig

The result in Table 4 revealed that out of the ten items assessed, three items (Items 6,9 and 10) yielded not statistically significant differences with p-values less than the alpha level of 0.05. Conversely, the remaining items (Items 1,2,3,4,5,7 and 8) showed statistically significant differences, as evidenced by p-values exceeding 0.05. This implies that the research hypothesis five was rejected, hence there is significant difference in the mean response between fish farmers and extension workers on erratic swimming behavioural communication skills need of farmers for profitable fish production in Akwa Ibom State.

Discussion of Findings

Fish Aggression Behavioural Communication Skills Need

The result of the findings of the study revealed that wounds on fish skin, fin flaring, chasing of smaller fish by bigger fish, nipping, mouth fighting by fish, jaw locking

by fish territorial defense among fish, fish darting around without direction and feed monopolization are the fish aggression behavioural communication skills needed by farmers. Also, the t-test analysis indicated that there is a significant difference between fish aggression behavioural communication skills needed by farmers, therefore, the null hypothesis is rejected. The significant difference between the farmers and extension agents could be as a result of the fact that farmers may not be as knowledgeable as the extension agents on ways to identify fish aggression and correct interpretation of fish aggression behavioural communication in farm management varies. Also, there could be a communication gap between extension agents and farmers regarding indicators of aggression in fish.

The result of the study is in consonance with the findings by Solomon and Okomoda (2019) who carry out a study on effects of darkness and light on aggressive behaviour and growth response of fingerlings of the African catfish (*Clarias gariepinus*) and observed that aggressive behaviour was quantified as a measure of percentage mortality of fish, wounds and scars on fish body. This is also in line with the study by Omosu (2020), who in a study showing patterns of aggressive attacks in juvenile steel head trout's observed fish nips, jaw locking mouth fighting and dorsal fin damage as forms of fish aggression

Fish Erratic Swimming Behavioural Communication Skills Need of Farmer

The result of the finding of the study revealed that uncoordinated movements of fish, fish darting across the pond, fish frequently bumping into pond, frequent surfacing without feeding motivation, damaged fin from colliding with pond walls, visible excess mucus on the body, fish ignoring feed due to disorientation are the fish erratic swimming behavioural skills need of farmers for profitable fish production. Also, the t-test analysis indicated that there is a significant difference in the mean rating between farmers and extension agents on the fish erratic swimming behavioural communication skills need of farmers. The significant difference in response between the farmer and extension agents could be attributed to variations in training and interpretative experienced. This is because the agents visit many farms, observed varied fish conditions while the farmers mostly observed his/her own stock.

The result of the study is in consonance with the findings of Johnson (2021) who through their study on behavioural and physiological assessment of glyphosate and paraquat toxicity to juveniles of African catfish (*clarias gariepinus*) identified behavioural cues such as restlessness, erratic swimming, loss of hyperactivity, darting suddenly, in fish exposed to herbicide. Also, the findings of the study by Ayoku, Osuji and Onojakaye (2020) on behavioural responses of African catfish *Clarias gariepinus* exposed to different chemicals identified erratic swimming and discolouration on fish body

Conclusion

From the study conducted and analysis carried out it is very evident that farmers need skills fish behavioural communication for profitable fish production in Akwa Ibom State. Wound on fish skin, fin flaring, chasing of smaller fish by bigger fish, nipping, mouth fighting by fish, jaw locking by fish, territorial defense among fish, and feed monopolization by fish are identified as fish aggression behavioural communication skills need of farmers.

Uncoordinated movement of fish, fish darting suddenly across the pond, fish frequently bumping into pond walls, fish frequently surfacing without feeding motivation, damaged fin from colliding with ponds walls, visible mucus on fish skin, fish ignoring feed due to disorientation are identified as fish erratic swimming behavioural communication skills need of farmers in Akwa Ibom State. Also there was a significant difference in the mean rating between fish farmers and extension agents on both fish aggression behavioural communication skills need and fish erratic swimming behavioural communication skills need for profitable fish production in Akwa Ibom State.

Recommendations

Based on the findings of the study, it was therefore recommended among others that:

1. The department of fisheries, ministry of Agriculture, Akwa Ibom State should integrate the identification of fish behavioural communication skills into their vocational trainings programmes in order to educate both fish farmers and extension agents to ensure profitable fish production in the state.
2. Agricultural Education Department in higher institution in the state should include fish behavioural communication skills in their curriculum to ensure that students can acquire relevant knowledge and skills in detecting fish behavioural communication.

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