Consumers' purchase intention of wild freshwater fish during the COVID-19 pandemic

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Abstract
The association between the COVID-19 pandemic and the wildlife trade in the seafood market in Wuhan has raised public concern regarding wildlife consumption and public health safety. Considering several coronavirus transmission incidents related to aquatic products and the location of wild freshwater fish in aquatic consumption in China, the effects of COVID-19 on the purchase intention of wild freshwater fish was investigated. Based on 1163 online questionnaires from eight provinces (including two province-level municipalities) in the Yangtze River Basin, ordered logistic regression was carried out to analyze the influencing factors of purchase intention of wild freshwater fish during the COVID-19 pandemic. The empirical results indicated that the COVID-19 pandemic had changed consumers' perceived risk and purchase frequency of wild freshwater fish. External stimulus caused by the COVID-19 pandemic had little influence on perceived risk and purchase intention. Consumer preference had a significant impact on perceived risk and purchase intention. Therefore, efforts should be put to strengthen the popularization of aquatic product knowledge, guide the public to develop scientific and civic eating habits, and improve the traceability system of aquatic products.

KEYWORDS perceived risk, purchase intention, the COVID-19 pandemic, wild freshwater fish

Abbreviations: SD, standard deviation; VIF, variance inflation factor.
The trade and consumption of wildlife and its products have contributed to the emergence of infectious diseases and the destruction of the ecological systems (Friant et al., 2020; Keesing et al., 2010; Ripple et al., 2016). Several studies have shown that 75% of the infectious diseases that threaten human health and economic stability are caused by the trade and consumption of wildlife (Jones et al., 2008; Lu et al., 2020; Miguel et al., 2020; Smith et al., 2017; Taylor et al., 2001). Wildlife is an important component of the pathogen transmission system, as demonstrated by the COVID-19, MERS, SARS, and other significant infectious diseases (Cohen, 2020; Cox-Witton et al., 2021; Evans et al., 2020; Lloyd-Smith et al., 2009).

After the outbreak of the COVID-19 pandemic, to ensure biosafety and ecological security and prevent major public health hazards, the Standing Committee of the National People's Congress of China issued the Decision on a Complete Ban of Illegal Wildlife Trade and the Elimination of the Unhealthy Habit of Indiscriminate Wild Animal Meat Consumption For the Protection of Human Life and Health on February 24, 2020. That is, the Committee banned hunting, trading, transporting of terrestrial wild animals, or consuming the meat thereof as prohibited in the Law of the People's Republic of China on the Protection of Wildlife and other relevant laws. To avoid the knock-on effect of the ban on wildlife consumption in the aquatic industry, the Ministry of Agriculture and Rural Affairs of China issued a Notice on Strengthening the Protection and Management of Wild Aquatic Animals, which clarified the management objectives and requirements for the management of different types of wild aquatic animals. Although the cause of the COVID-19 pandemic has not been finalized, the coronavirus was once found in the Wuhan seafood market, and epidemics related to aquatic products erupted in Beijing, Dalian, Qingdao, and Shanghai. Thus, the outbreak of COVID-19 and the ban on wildlife consumption issued in the pandemic context were thought to have influence on consumers' awareness of the health and safety and purchase intention of wild aquatic products.

Life patterns and consumption habits have been changed owing to the COVID-19 pandemic (Roe et al., 2021; Salem & Nor, 2020; Sheth, 2020). A few studies have investigated the effect of the COVID-19 pandemic on food systems and consumer behavior. Güney and Sangün (2021) conducted a consumer survey to explore how COVID-19 affected food consumption behavior and found that price increase concerns, safety, and natural food preference were important factors in changing consumption behavior during the pandemic. Latip et al. (2021) explored the factors influencing intention to purchase organic food in Malaysia in the context of the COVID-19 pandemic and found that purchase intention was influenced by attitude, perceived autonomy, and social pressure. Shim et al. (2021) investigated the factors influencing coffee shop purchase intention during the pandemic. The results showed that purchase intention was significantly affected by hygiene, health, and ease of app use. Caso et al. (2022) found that structural constraints, such as lockdown measures and social-psychological factors, changed people's dietary habits after the COVID-19 outbreak, and food consumption patterns were improved in this situation. Moreover, some studies have focused on perceived risk and its impact on consumption behavior during the pandemic. Li et al. (2021) examined the relationship between perceived risk and panic buying in the case of COVID-19. The results proved that consumers with higher perceived risk levels were more likely to participate in panic buying. Bae and Chang (2021) examined the impact of the first wave of the pandemic on the behavioral intention of tourism, and demonstrated a negative impact. Habib and Hamadneh (2021) explored the impact of perceived risk on consumers' technology acceptance in online shopping amidst the COVID-19 pandemic. They found that the spread of COVID-19 had a significant impact on customers' online shopping behavior. Munikrishnan et al. (2021) investigated the impact of perceived risk on purchase intention of online food. The results confirmed that time and psychological risks can significantly influence the intention to purchase online food. Palau-Saumell et al. (2021) analyzed the impact of the perceived risk of COVID-19 on consumers' attitude and behavior toward locally produced food and found that it influenced purchase behavior.

Regarding fish consumption, wild fish are more nutritious and delicious than bred ones and are suitable for entertaining or giving gifts in the traditional view of Chinese customers (Mai, 2016). Sun et al. (2015) found...
that residents of Beijing and Shanghai prefer wild aquatic products. According to a random survey of consumers in Beijing by the Industrial Economy Research Office of the national bulk freshwater fish industry technology system, freshwater fish is the main choice for fish consumption, with 7.21% of consumers buying wild fish and 29.57% of consumers buying both wild fish and bred fish (Chen & Zhang, 2013). Although wild freshwater fish plays an important role in the caught fish industry and aquatic product market, few studies have explored consumers’ purchase intention of wild freshwater fish. Hence, this study aims to explore the purchase intention of wild freshwater fish in the context of the COVID-19 pandemic and its psychological motivations, so that we could provide related suggestions to strengthen the popularization of aquatic product knowledge, guide the public to develop scientific and civic eating habits and improve the traceability system of aquatic products.

2 | LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Perceived risk is defined as a potential subjective loss that may threaten the health and well-being of an individual (Adeola, 2007; Lim, 2003; Paek & Hove, 2017). This was derived from the uncertainty and severity of the results. Perceived risk has been included in research on consumer behavior and is thought to be a central element in the decision-making process (Bruwer & Cohen, 2019; Lusk & Coble, 2005). Building upon the theory of utility maximization, individuals tend to weigh perceived risks and benefits, and they always choose maximizing utility within the risk they can bear (Yeung & Morris, 2001). A review of related studies shows that perceived risk has a significant impact on consumers' purchase intentions. Kanwal (2021) explored the effect of perceived risk on consumers' purchase intention toward luxury brands during COVID-19. The results revealed that the purchase intention was significantly influenced by perceived risk. Leung and Cai (2021) analyzed the association between perceived risk and the intention to order digital food deliveries during a pandemic. Perceived risk has a negative effect on purchase intention. Ahmed et al. (2021) investigated the impact of perceived risk, perceived technology, and trust on consumers' online shopping intentions. They found a significant negative relationship between perceived risk and online shopping intention. During the COVID-19 outbreak, perceived risk is highly relevant to consumers' purchase intention, as they feel uncertainty and a lack of control when facing this complicated context. Therefore, the following hypothesis is proposed:

**H1**: Perceived risk has a significant negative impact on consumers' purchase intention of wild freshwater fish.

According to Stimulus-Organism-Response theory, the formation of consumer behavior goes through three phases: external stimulus, psychological change, and final response. The external stimulus provided by the environment causes psychological changes in individuals and then affects their behavior (Jacoby, 2002). Because of the high level of infection risk, pandemic diseases have been found to be associated with the feeling of dread, affecting consumers' perceived risk (Kim, 2019; Zheng et al., 2020). The COVID-19 pandemic and other public health crises have significantly increased perceived risk. Toanoglou et al. (2021) examined the impact of COVID-19, crisis severity, media coverage, and governance on the perceived risk of traveling. The results demonstrated that the growth rate of the pandemic and media coverage had a cross-level interaction effect on tourists' perceived risk. In addition, a public health crisis such as COVID-19 has caused a shift in the way people consume their food, which may lead to healthier and more sustainable consumption habits (Ben Hassen et al., 2020; Xie et al., 2020). Quevedo-Silva et al. (2021) explored the impact of the COVID-19 pandemic on consumers' purchase intentions of certified beef in Brazil. It was found that the higher the level of concern about the pandemic, the greater the impact of traceability on meat purchase intention. Qi and Ploeger (2021) conducted a quantitative study to analyze Chinese consumers' intention to purchase green food during the COVID-19 pandemic and proved that purchase intention was positively influenced by the pandemic. The COVID-19 pandemic introduced consumption behavior as an
external stimulus, which disturbed the original steady-state and led to an increase in perceived risk and a decrease in purchase intention for targeted food. Therefore, the following hypotheses are proposed:

**H2:** The external stimulus such as the COVID-19 pandemic has a significant positive impact on perceived risk.

**H3:** The external stimulus such as the COVID-19 pandemic has a significant negative impact on the purchase intention of wild freshwater fish.

Consumer preference is defined as subjective feelings and judgments of the products or services purchased by individuals, and it has been proven to be a critical factor affecting consumers' purchasing intentions (Dam, 2020; Pebriani et al., 2018; Sirgy, 2015; Umberger et al., 2002). According to Jenkins et al. (2020), individuals’ strong preference for certain foods will weaken their concern for other attributes, such as safety. Grunert et al. (2004) demonstrated that consumers with a sensory preference for genetically modified cheeses had less negative attitudes toward genetically modified organisms in food production. The public tends to believe that natural foods are less risky than artificial or technical foods, because of their preference for natural foods. Park et al. (2018) investigated the factors influencing the perceived risk of the Internet of Things and demonstrated the effects of individuals' propensities on perceived risk. S. Wang and Adhikari (2018) examined U.S. consumers' perceptions and other influencing factors of monosodium glutamate. The results showed a significant positive relationship between natural food preference and perceived risk. The preference for the meat of wild animals is rooted in traditional Chinese diet culture. It can induce the consumption and supply of foods contrary to animal welfare and ecological security. Infectious disease outbreaks and ecosystem degradation are closely related to wildlife consumption. This urges the public to change their preferences for wildlife and establish a scientific and civilized dietary concept. Therefore, consumer preference is introduced in this study as an important factor, and the following hypotheses are proposed:

**H4:** Consumer preference has a significant negative impact on perceived risk.

**H5:** Consumer preference has a significant positive impact on the purchase intention of wild freshwater fish.

Based on the analysis above, the perceived risk, consumer preference, external stimulus, and purchase intention are introduced into the theoretical framework below (Figure 1) to investigate the causes and underlying mechanisms of the purchase intention of wild freshwater fish.

### 3 | DATA COLLECTION AND DESCRIPTIVE ANALYSIS

The data were collected by publishing questionnaires on Wenjuanxing, the largest online survey platform in China widely used in academic research (J. Wang et al., 2020). The survey questionnaire consisted of two sections. The first section contained questions about the respondents' demographic characteristics. The second section included...
the purchase frequency of wild freshwater fish before and after the outbreak of COVID-19 (purchase frequency before COVID-19, in March, April, and May), the degree affected by the pandemic (infection or income reduction, etc.), the preference for wild freshwater fish, and other attributes related to variables influencing purchase intention. To avoid confusion, we defined freshwater fish as noncultured aquatic products, such as fish, shrimp, and crabs caught in the Yangtze River and its branches, such as the Jialing River, Han River, Dongting Lake, Taihu Lake, and Poyang Lake at the beginning of the questionnaires. Considering the differences in consumption habits and the convenience of purchasing wild freshwater fish in different regions, the consumers in eight provinces (including two province-level municipalities)—Shanghai, Jiangsu, Chongqing, Sichuan, Hunan, Hubei, Jiangxi, and Anhui—in the Yangtze River Basin were selected as respondents. To ensure the representativeness of the area distribution of the samples, a control on the sample size was also adopted.

Before formal data collection, a small-scale pretest was conducted by distributing questionnaires through WeChat, a social networking tool widely used in China. The questionnaires were distributed in June 2020. Finally, 1235 questionnaires were returned, and 1163 questionnaires were qualified for further analysis, with an effective rate of 94%. The respondents’ demographic characteristics are presented in Table 1. To explore the impact of the COVID-19 outbreak on the consumption of wild freshwater fish, this study performed a comparative analysis of the consumption status before and after the pandemic. Several questions were asked to investigate the purchase frequency, expenditure, and purchase channels of wild freshwater fish before and after the COVID-19 outbreak. Concerning the consumption status before the outbreak of COVID-19, most families purchased wild freshwater fish 1–2 times per month, and 27.6% of the families purchased three or more times per month. Most families spent less than 10% of their total aquatic product expenditure on wild freshwater fish. This revealed that most families had experience purchasing wild freshwater fish. However, wild freshwater fish mainly played an enliven role in daily aquatic product consumption due to the wide variety of aquatic products selected and the high price of wild freshwater fish. As for the purchase channels of wild freshwater fish, 58.9% of consumers purchased wild freshwater fish in the comprehensive farmers market. A possible reason may be that the comprehensive farmers market has a wide range of products, including vegetables and meat, for daily consumption in addition to aquatic products. In addition, 10.9% of consumers bought wild freshwater fish from roadside shops, which is also in line with the reality that residents in rural areas, especially in the rainy season, catch fish and shrimp from rural rivers and sell them along the roadside. For the origins and labels of wild freshwater fish purchased by consumers, only 36% of the respondents said that there were labels and 41.2% of the respondents had no idea about the origins of the fish they purchased. This indicates that there is still a significant deficiency in the market management of wild freshwater fish. In addition, one-third of consumers attached great importance to whether freshwater fish are wild, which indicates that wild freshwater fish play an important role in the entire aquatic product market. However, only 8.7% of consumers were confident in distinguishing wild freshwater fish from bred fish, reflecting the lack of consumer knowledge of wild freshwater fish to a certain extent (Table 2).

After comparing and analyzing the purchase frequency of wild freshwater fish before and after the COVID-19 pandemic, it was found that the outbreak of COVID-19 caused consumers to reduce their purchase frequency of wild freshwater fish. Although the frequency increased again with the control of the pandemic, it was still at a low level compared with that before the pandemic. A possible explanation is that many aquatic product trading markets were closed down or restricted, and consumers stayed at home for social distancing because of the need for infectious disease prevention and control, making it inconvenient to purchase wild freshwater fish. On the other hand, the COVID-19 outbreak also had an impact on consumers’ perceived risk of wild freshwater fish. Considering the possibility of infection by the coronavirus carried by wild animals, consumers reduced their consumption. In summary, the COVID-19 pandemic has had an impact on consumers’ food consumption, and this impact has continued for a long time after the pandemic outbreak (Figures 2 and 3).
4 | EMPIRICAL ANALYSIS

4.1 | Methodology

In this study, consumers’ purchase intention of wild freshwater fish was selected as a dependent variable, and external stimulus, consumer preference, and perceived risk were selected as independent variables. The demographic variables are polytomous variables that are included in the model as control variables in the form of dummy variables. To make the respondents express themselves more accurately, we used a five-point Likert-scale ranging from 1 (strongly disagree) to 5 (strongly agree). Table 3 presents the descriptions and basic statistics of the variables.
The dependent variable of our study is purchase intention which is a Likert-scale ordinal type categorical dependent variable ranging from 1 (strongly disagree) to 5 (strongly agree). Since ordered logistic regression is an extended type of logistic regression in which the outcome variable is ordered into more than two categories (Kropat et al., 2017; Michalaki et al., 2015; Nwakuya & Mmaduka, 2019; Williams, 2006), it is reasonable to choose ordered logistic regression to model the purchase intention. The ordered logistic model can be written as

| Variable | Group                  | Frequency | Percentage |
|----------|------------------------|-----------|------------|
| Purchase frequency (times/month)  | Rarely     | 421       | 36.2       |
|         | 1–2                    | 421       | 36.2       |
|         | 3–4                    | 194       | 16.7       |
|         | 5–6                    | 50        | 4.3        |
|         | Above 6                | 77        | 6.6        |
|         | Below 10%              | 839       | 72.1       |
|         | 10%–29%                | 189       | 16.3       |
|         | 30%–49%                | 82        | 7.1        |
|         | 50%–79%                | 31        | 2.7        |
|         | Above 80%              | 22        | 1.9        |
| Purchase channel (multiple choice) | Seafood market        | 245       | 21.1       |
|         | Comprehensive farmers market | 685     | 58.9       |
|         | Supermarket            | 481       | 41.4       |
|         | Roadside shop          | 127       | 10.9       |
|         | Online shopping        | 71        | 6.1        |
|         | Gifts from others      | 107       | 9.2        |
|         | Others                 | 110       | 9.5        |
| Origins and labels | Know origins and have labels | 419 | 36 |
|         | Know origins but have no labels | 265 | 22.8 |
|         | Don’t know origins and have no labels | 479 | 41.2 |
| Pay great attention to the wild freshwater fish | Very disagree | 43 | 3.7 |
|         | Disagree               | 232       | 19.9       |
|         | Neutral                | 523       | 45         |
|         | Agree                  | 271       | 23.3       |
|         | Very agree             | 94        | 8.1        |
| With ability to distinguish between wild and bred | Very disagree | 247 | 21.2 |
|         | Disagree               | 491       | 42.2       |
|         | Neutral                | 324       | 27.9       |
|         | Agree                  | 59        | 5.1        |
|         | Very agree             | 42        | 3.6        |
4.2 Results and discussion

STATA software was used to carry out ordered logistic regression analysis, and four models were constructed, in which perceived risk was the intervening variable. Model 1 explored the impact of external stimulus and consumer preference on perceived risk. Model 2 investigated the relationship between perceived risk and purchase intention.
| Variable                  | Items                                                                 | Code | description                          | Mean  | SD    |
|--------------------------|------------------------------------------------------------------------|------|--------------------------------------|-------|-------|
| Intention                | I will purchase wild freshwater fish                                   | Intention 1 = strongly disagree | 2.572 | 1.117 |
|                          |                                                                        | 2 = disagree                      |       |       |
|                          |                                                                        | 3 = neutral                       |       |       |
|                          |                                                                        | 4 = agree                         |       |       |
|                          |                                                                        | 5 = strongly agree                |       |       |
| External stimulus        | I am concerned about COVID-19.                                          | S1 1 = strongly disagree          | 4.490 | 0.719 |
|                          |                                                                        | 2 = disagree                      |       |       |
|                          |                                                                        | 3 = neutral                       |       |       |
|                          |                                                                        | 4 = agree                         |       |       |
|                          |                                                                        | 5 = strongly agree                |       |       |
| My family income has been influenced by COVID-19. | S2 1 = strongly disagree          | 3.101 | 1.117 |
|                          |                                                                        | 2 = disagree                      |       |       |
|                          |                                                                        | 3 = neutral                       |       |       |
|                          |                                                                        | 4 = agree                         |       |       |
|                          |                                                                        | 5 = strongly agree                |       |       |
| The severity of COVID-19. | S3 1 = 0–0.1 in 10,000 is infected                                      | 2.083 | 1.057 |
|                          |                                                                        | 2 = 0.1–0.2 in 10,000 are infected |       |       |
|                          |                                                                        | 3 = 0.2–1 in 10,000 are infected  |       |       |
|                          |                                                                        | 4 = 1–20 in 10,000 is infected    |       |       |
|                          |                                                                        | 5 = above 20 in 10,000 are infected |       |       |
| Consumer preference      | I think wild freshwater fish have high nutrition.                      | P1 1 = strongly disagree          | 2.905 | 0.969 |
|                          |                                                                        | 2 = disagree                      |       |       |
|                          |                                                                        | 3 = neutral                       |       |       |
|                          |                                                                        | 4 = agree                         |       |       |
|                          |                                                                        | 5 = strongly agree                |       |       |
|                          | I think wild freshwater fish have a good taste.                        | P2 1 = strongly disagree          | 3.172 | 1.013 |
|                          |                                                                        | 2 = disagree                      |       |       |
|                          |                                                                        | 3 = neutral                       |       |       |
|                          |                                                                        | 4 = agree                         |       |       |

(Continues)
| Variable                          | Items                                                                 | Code | description                  | Mean  | SD   |
|----------------------------------|----------------------------------------------------------------------|------|------------------------------|-------|------|
| I pay great attention to wild    |                                                                      |      |                              |       |      |
| freshwater fish.                 |                                                                      |      |                              |       |      |
|                                  |                                                                      | P3   | 1 = strongly disagree        | 3.121 | 0.943|
|                                  |                                                                      | 2 = disagree                        |       |      |
|                                  |                                                                      | 3 = neutral                          |       |      |
|                                  |                                                                      | 4 = agree                            |       |      |
|                                  |                                                                      | 5 = strongly agree                   |       |      |
| I pay great attention to food    |                                                                      |      |                              |       |      |
| safety.                          |                                                                      |      |                              |       |      |
|                                  |                                                                      | P4   | 1 = strongly disagree        | 4.198 | 0.728|
|                                  |                                                                      | 2 = disagree                          |       |      |
|                                  |                                                                      | 3 = neutral                          |       |      |
|                                  |                                                                      | 4 = agree                            |       |      |
|                                  |                                                                      | 5 = strongly agree                   |       |      |
| Perceived risk                   | I think wild freshwater fish are unsafe.                            | Risk | 1 = strongly disagree        | 3.156 | 1.029|
|                                  |                                                                      | 2 = disagree                          |       |      |
|                                  |                                                                      | 3 = neutral                          |       |      |
|                                  |                                                                      | 4 = agree                            |       |      |
|                                  |                                                                      | 5 = strongly agree                   |       |      |
|                                  | I think wild freshwater fish carry coronavirus.                     | Virus | 1 = yes                      | 2.414 | 0.692|
|                                  |                                                                      | 2 = no                               |       |      |
|                                  |                                                                      | 3 = neutral                          |       |      |
| Demographic characteristics      | Age                                                                  | Age | 1 = below 30                 | 2.332 | 0.990|
|                                  |                                                                      | 2 = 31–40                            |       |      |
|                                  |                                                                      | 3 = 41–50                            |       |      |
|                                  |                                                                      | 4 = 51–60                            |       |      |
|                                  |                                                                      | 5 = above 60                         |       |      |
|                                  | Gender                                                               | Gender | 1 = male                    | 0.511 | 0.500|
|                                  |                                                                      | 2 = female                           |       |      |
|                                  | Occupation or education fields                                       | Job  | 1 = related (fishery, food,   | 0.391 | 0.488|
|                                  |                                                                      |      | health)                      |       |      |
|                                  |                                                                      | 0 = unrelated                        |       |      |
|                                  | Education                                                            | Edu  | 1 = secondary school and     | 3.261 | 1.153|
|                                  |                                                                      |      | below                        |       |      |
|                                  |                                                                      | 2 = high school                      |       |      |
|                                  |                                                                      | 3 = junior college                   |       |      |
Model 3 explored the impact of external stimulus, consumer preference, and perceived risk on purchase intention, and Model 4 is the robustness test of Model 3. Before conducting the regression analysis, it was verified to pass the multicollinearity test (VIF < 10). Table 4 presents the specific analysis results.

### 4.2.1 The impact of perceived risk

Perceived risk had a significant negative impact on the purchase intention of wild freshwater fish (Models 2, 3, and 4). Consumers with a higher level of perceived risk of wild freshwater fish are more likely to reduce their purchase intention. This finding is consistent with those reported by Hakim et al. (2021) and Shin and Kang (2020). During a pandemic, individuals tend to evaluate risk and make decisions based on their perceived risk. An individual’s perception of risk may not be completely in line with the actual situation; some are overestimated and others are underestimated. However, once there is a possibility of loss, it is highly likely to contribute negatively to purchase intention and purchase behavior (Sánchez-Cañizares et al., 2021). Comparing the perceived risk and purchase frequency of wild freshwater fish before and after COVID-19 (Figures 2 and 3) also showed a negative relationship between perceived risk and purchase behavior. Although most consumers have given positive feedback on the safety of wild freshwater fish, some consumers have changed their cognition and perceived the risk of wild freshwater fish and the purchase frequency reduced. Therefore, in the context of a public health crisis such as COVID-19, consumers’ perceived risk rises rapidly in a short period and affects purchase intention and behavior. H1 was confirmed.

### 4.2.2 The impact of external stimulus

Among the three items to measure external stimulus, only S3 (the severity of COVID-19) had a significant positive effect on the purchase intention of wild freshwater fish (Models 3 and 4). H3 was rejected. Qi et al. (2020) explored the influential factors, including COVID-19, on green food purchase intention and the results revealed that the COVID-19 crisis increased purchase intention. According to the descriptive analysis above, the outbreak of
| Variable                        | Code | Model 1     | Model 2     | Model 3     | Model 4     |
|--------------------------------|------|-------------|-------------|-------------|-------------|
| Dependent variable             |      | Risk        | Intention   | Intention   | Intention   |
| External stimulus              | S1   | 0.165**     | 0.024       | -0.005      |             |
|                                |      | (0.080)     | (0.082)     | (0.080)     |             |
|                                | S2   | 0.069       | 0.026       | 0.020       |             |
|                                |      | (0.053)     | (0.055)     | (0.054)     |             |
|                                | S3   | -0.066      | 0.119**     | 0.158***    |             |
|                                |      | (0.054)     | (0.056)     | (0.055)     |             |
| Consumer preference            | P1   | -0.257***   | 0.377***    | 0.462***    |             |
|                                |      | (0.081)     | (0.082)     | (0.081)     |             |
|                                | P2   | -0.671***   | 0.668***    | 0.829***    |             |
|                                |      | (0.080)     | (0.084)     | (0.083)     |             |
|                                | P3   | -0.123*     | -0.127*     | -0.080      |             |
|                                |      | (0.064)     | (0.067)     | (0.065)     |             |
|                                | P4   | -0.044      | 0.161*      | 0.139*      |             |
|                                |      | (0.081)     | (0.086)     | (0.083)     |             |
| Perceived risk                 | Risk | -1.362***   | -1.135***   |             |             |
|                                |      | (0.069)     | (0.073)     |             |             |
|                                | Virus1 |             |             | -0.857***   |             |
|                                |      |             |             | (0.191)     |             |
|                                | Virus2 |             |             | 0.773***    |             |
|                                |      |             |             | (0.129)     |             |
| Demographic characteristics    | Age2 | -0.160      | 0.040       | -0.154      | -0.085      |
|                                |      | (0.154)     | (0.157)     | (0.163)     | (0.160)     |
|                                | Age3 | -0.230      | -0.088      | -0.437**    | -0.360**    |
|                                |      | (0.164)     | (0.164)     | (0.172)     | (0.169)     |
|                                | Age4 | -0.418*     | -0.179      | -0.523**    | -0.384*     |
|                                |      | (0.214)     | (0.212)     | (0.222)     | (0.216)     |
|                                | Age5 | -0.962*     | -0.769      | -0.623      | -0.256      |
|                                |      | (0.516)     | (0.532)     | (0.532)     | (0.527)     |
|                                | Gender | -0.720***   | 0.096       | 0.095       | 0.237***    |
|                                |      | (0.115)     | (0.116)     | (0.120)     | (0.119)     |
|                                | Job  | -0.053      | -0.046      | -0.049      | -0.056      |
|                                |      | (0.117)     | (0.118)     | (0.122)     | (0.119)     |
|                                | Edu2 | -0.349      | -0.077      | 0.021       | 0.192       |
|                                |      | (0.226)     | (0.229)     | (0.236)     | (0.230)     |
COVID-19 caused a decrease in the purchase frequency of wild freshwater fish, so it was assumed that the more critical the pandemic is, that is, the more people infected, the lower the consumers’ purchase intention for wild freshwater fish related to the virus. However, the regression results were inconsistent with our prior assumption. A possible explanation is that the decrease in purchase frequency during the pandemic was influenced by multiple factors such as lockdowns, restrictions, perimeter closures, and social distancing (Cappelli & Cini, 2020; PalauSaumell et al., 2021), making it inconvenient to access wild freshwater fish. More than 60% of the respondents still believed that there was no risk of consuming wild freshwater fish after the pandemic (Figure 3). Thus, we can surmise that purchase intention was underestimated. The consumption behaviors decreased due to the restriction of objective conditions, but the purchase intention of wild freshwater fish remained at a high level. In addition, Model 1 proved that there was a significant positive relationship between S1 (I am concerned about COVID-19) and Risk (I think wild freshwater fish are unsafe); that is, the more consumers give importance to the COVID-19 pandemic, the greater the perceived risk of wild freshwater fish, which is in line with previous research (Haque et al., 2021). Thus, H2 was partially confirmed. Considering that perceived risk has a significantly negative impact on purchase intention, external stimulus may indirectly affect purchase intention through perceived risk.

| Variable | Code | Model 1 | Model 2 | Model 3 | Model 4 |
|----------|------|---------|---------|---------|---------|
| Edu3     | −0.701*** | −0.400* | −0.358 | −0.031 |
|          | (0.217) | (0.214) | (0.223) | (0.217) |
| Edu4     | −0.607*** | −0.276 | −0.274 | −0.009 |
|          | (0.214) | (0.212) | (0.223) | (0.218) |
| Edu5     | −0.772*** | −0.266 | −0.236 | −0.004 |
|          | (0.263) | (0.257) | (0.270) | (0.265) |
| Child    | 0.038 | 0.179 | 0.065 | −0.085 |
|          | (0.121) | (0.121) | (0.124) | (0.160) |
| Patient  | 0.040 | 0.069 | 0.109 | −0.360 |
|          | (0.165) | (0.168) | (0.173) | (0.169) |
| Income2  | −0.148 | 0.230* | 0.321** | −0.384*** |
|          | (0.130) | (0.130) | (0.134) | (0.216) |
| Income3  | −0.187 | 0.273 | 0.243 | −0.256* |
|          | (0.189) | (0.186) | (0.194) | (0.527) |
| Income4  | −0.769 | 0.120** | 0.335 | 0.237** |
|          | (0.302) | (0.294) | (0.306) | (0.119) |
| Income5  | 0.114 | 0.369 | 0.349 | −0.056 |
|          | (0.237) | (0.247) | (0.252) | (0.119) |

| LR χ²     | 343.01 | 510.09 | 704.44 | 506.48 |
| Log likelihood | −1474.8234 | −1418.6242 | −1321.4505 | −1420.4282 |

* p < 0.05.
** p < 0.01.
*** p < 0.001.
4.2.3 | The impact of consumer preference

Consumer preference had a significant impact on the purchase intention of wild freshwater fish. There was a positive relationship between P1 (I think wild freshwater fish have high nutrition), P2 (I think wild freshwater fish have a good taste) and purchase intention (Models 3 and 4). H5 was confirmed. This result means that when consumer preference is high, purchase intention increases, which is consistent with the findings of Vinh (2016) and Kusuma and Miartana (2018), among others. Concerning the association between consumer preference and perceived risk, it was found that consumer preference has a negative influence on perceived risk; that is, when consumers have a positive evaluation of the nutrition and taste of the wild freshwater fish and attach great importance to the wild freshwater fish, they are likely to reduce their concern about other attributes such as safety. H4 was confirmed. Based on these results, it can be said that consumers who show a strong preference for wild freshwater fish may perceive less risk and maintain high purchase intention. The deep-rooted view in Chinese traditional food culture is that wild animals are delicious and nourishing, and this unhealthy preference can easily lead to the supply of unsafe and unsustainable food, resulting in infectious diseases and ecosystem degradation.

4.2.4 | The mediating effect of perceived risk

According to the results of ordered logistic regression, S3 (the severity of COVID-19) was selected to represent the external stimulus, and P1 (I think wild freshwater fish have high nutrition) and P2 (I think wild freshwater fish have a good taste) represent the consumer preference. The bootstrapping method was then used to test the mediating effect of perceived risk. Table 5 shows the indirect effects of external stimulus and consumer preference on purchase intention. In the path from external stimulus to purchase intention, the confidence intervals of the bootstrap test are (−0.018, 0.210), (−0.018, 0.052), and (−0.011, 0.097), all of which contain zero, indicating that the direct effect of the external stimulus on purchase intention and the mediating effect of perceived risk is not significant. In other words, the COVID-19 pandemic has had little influence on consumers’ perceived risk and purchase intention of wild freshwater fish. With respect to the path from consumer preference to purchase intention, the confidence intervals of the bootstrap test are (1.163, 1.499), (0.165, 0.249), and (0.329, 0.463), none of which contain zero, indicating that perceived risk plays a partial mediating role in the purchase intention of wild freshwater fish. In other words, on the one hand, consumer preference toward wild freshwater fish has a direct positive impact on purchase intention; on the other hand, strong preference increases purchase intention by reducing perceived risk.

5 | CONCLUSIONS AND IMPLICATIONS

Previous studies have shown that public health emergencies, such as COVID-19, have a significant impact on consumers’ food purchase intentions (Chenarides et al., 2021; H. Wang et al., 2021). The coronavirus has been found in the Wuhan seafood market, salmon in the Beijing Xinfadi market, and prawns imported from Ecuador. Although it was proven that the virus was not carried by the aquatic products themselves but was detected in
environments such as chopping boards, outer packages, and containers, the purchase intention of aquatic products had been affected, and the industry was hit. Thus, we explored consumers’ purchase intentions of wild freshwater fish during the COVID-19 pandemic.

Based on data collected from eight provinces (including two province-level municipalities) in the Yangtze River Basin, this study investigated the causes and underlying mechanisms of consumers’ purchase intention of wild freshwater fish using ordered logistic regression. The study showed the following results. (1) During the outbreak of the COVID-19 pandemic, the perceived risk and purchase frequency of wild freshwater fish changed. (2) The external stimulus caused by the COVID-19 pandemic had little influence on the perceived risk and purchase intention of wild freshwater fish, and the mediating effect of perceived risk was not significant. Consumer knowledge of aquatic products was limited. After the outbreak of COVID-19, the vast majority of consumers believed that wild freshwater fish do not have safety issues; therefore, the perceived risk was low, and purchase intention maintained at a high level. (3) Consumer preference had a significant impact on perceived risk and purchase intention, with perceived risk playing a mediating role. The greater the consumer preference, the smaller the perceived risk and the higher the purchase intention.

Based on the findings of this study, practical implications are proposed. First, it is important to strengthen the popularization of knowledge related to aquatic products. Consumers show great concern for the safety of aquatic products. Nonetheless, their cognition of the concept of aquatic product is lacking; they also lack knowledge about the nutrition and safety of aquatic products. Thus, it is necessary to strengthen online and offline publicity and education on aquatic product-related knowledge and conduct publicity activities in communities or aquatic products trading markets. In addition, we should give full play to the role of mass media to enhance consumers' knowledge of bred and wild aquatic products, and teach them the skills of distinguishing and choosing high-quality aquatic products. Second, it is important to strengthen consumer concept education. Influenced by traditional eating habits, many consumers believe that wild freshwater fish have advantages in terms of nutrition and taste, hence their indiscriminate consumption of wild freshwater fish. The overconsumption of wild fish and prejudice against breeding aquatic products should be eliminated. This urges consumers to treat and consume wild freshwater fish rationally and develop scientific and civic eating habits. Finally, it is important to strengthen market supervision and improve the traceability of aquatic products. The trade of wild freshwater fish of unknown origin causes hidden dangers in food safety. It is necessary to improve the market access system for aquatic products and optimize their circulation channels of aquatic products. In addition, the traceability system should be improved to avoid unidentified aquatic products flowing to the consumers' dining tables and create a healthy and scientific consumption environment for consumers.

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DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHIC STATEMENT
Not applicable.

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