

# The Experimental Research on Effects of Ship Navigation on Fish of Pearl River

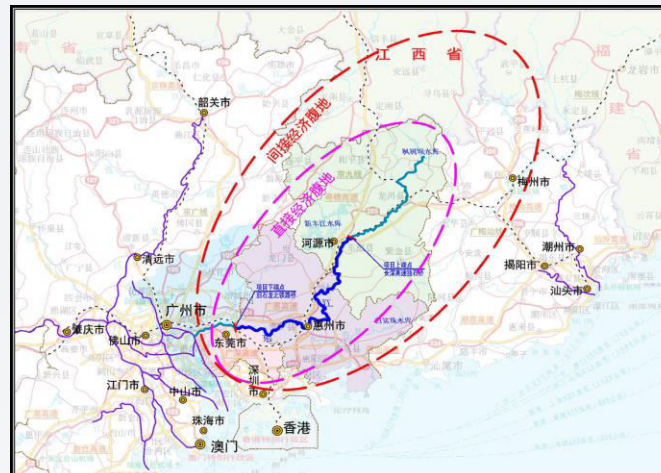
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# Content

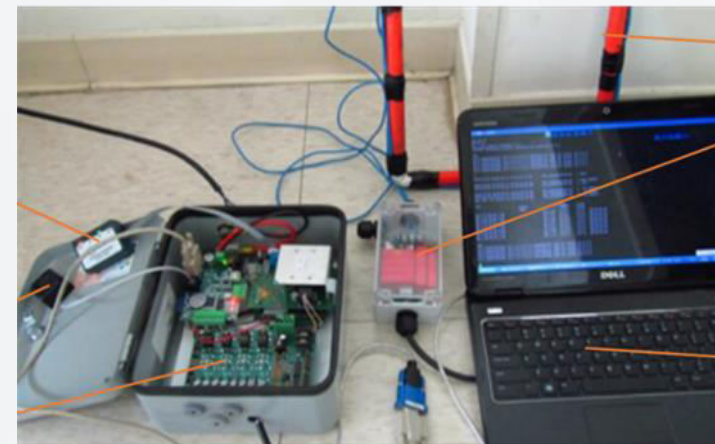
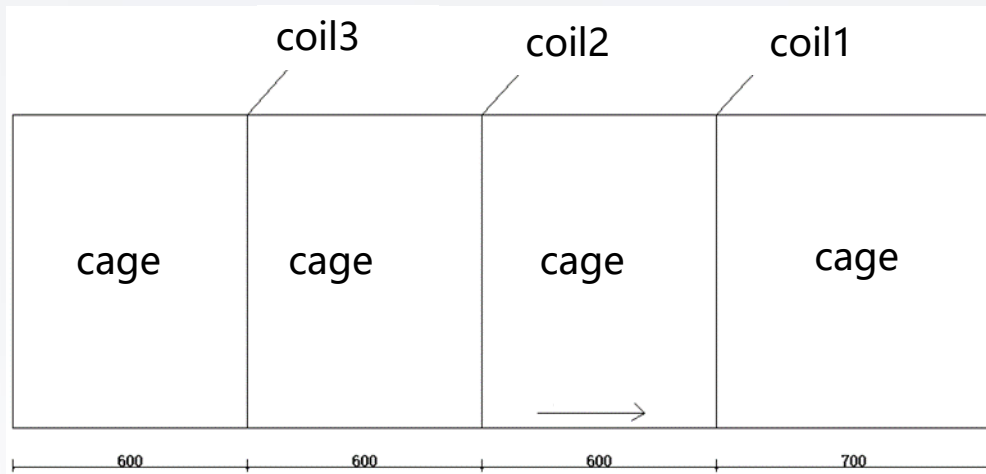
- Research background
- Material and methods
- Result
- Conclusion

- ◆ Dongjiang River is one of the three major rivers in the Pearl River basin, with a total length of 562km
- ◆ Make full use of the advantages of Dongjiang water resources, and play a positive role in promoting the economic development of the basin
- ◆ After the upgrading of the waterway, the number of ships in the section of the Dongjiang waterway will increase, which may have an impact on fish.
- ◆ Therefore, it is necessary to carry out research on the impact of ship navigation on fish, in order to provide ecological protection in the Dongjiang River basin.



## 1 Experimental Device:

- ◆ The study of fish behavior by ship navigation is carried out by using PIT telemetry system
- ◆ By fixing the PIT coils in the experimental cage, a total of 3 PIT coils are placed in each cage
- ◆ The distance of each coil is 60cm, and the response of the fish with the PIT tag is recorded when the ship passes
- ◆ PIT telemetry record fish by receiving signals from tags



## 2 experimental fish:

- ◆ Grass carp was selected as the experimental fish in this study
- ◆ The source of experimental fish was obtained by means of net fishing in the reach of Dongjiang River basin
- ◆ After the fish is caught, and put into the tank for a week, the water temperature of tank is 23~25°C, and the dissolved oxygen is maintained above 7.0 mg/L
- ◆ Before the experiment, grass carp with good state were selected as experimental fish



## 3 PIT marking:

- ◆ Fish are anesthetized before tagging
- ◆ The marks were put into the fish and keep for 48 hours to record the state of the fish.
- ◆ Fish with good state were selected from the tagged fish and put into the cage to enter the experiment, and the marking code of the experimental fish were recorded

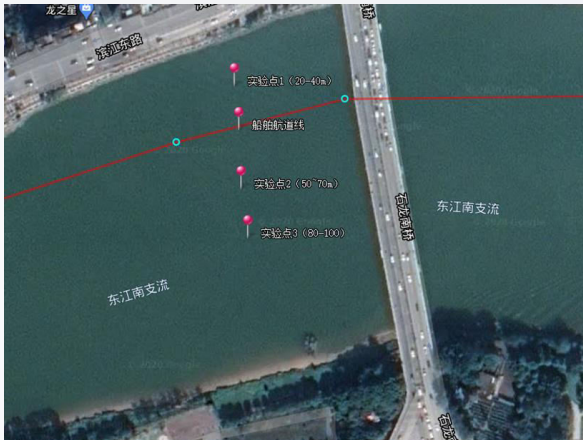


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```
UP upload detection records
UH show upload history
RP enter report interval
TF select tag format (D=decimal, H=hex, B=bi-hex)
CS column separator (S=spaces, T=tabs, C=commas)
RN enter reader name
UD upload reader status by date
TagTracker functions
EX export TagTracker database
IM import TagTracker database
Reader configuration
DT set date and time
FR factory reset datalogger and reader
ON set automatic on/off times
CG change reader settings
MX enter mux sequence
MV set minimum voltage before shutdown
DM select detection messages to display
PM PTAGIS compatibility mode (PM0 = disable, PM1 = enable)
CO enter comment to log file
RB reboot datalogger
Performance monitor
SS show scans per second and pulse timings
AD show reader voltages, amperages
AV calibrate analog voltage
RT read board temperature
WR write tag id
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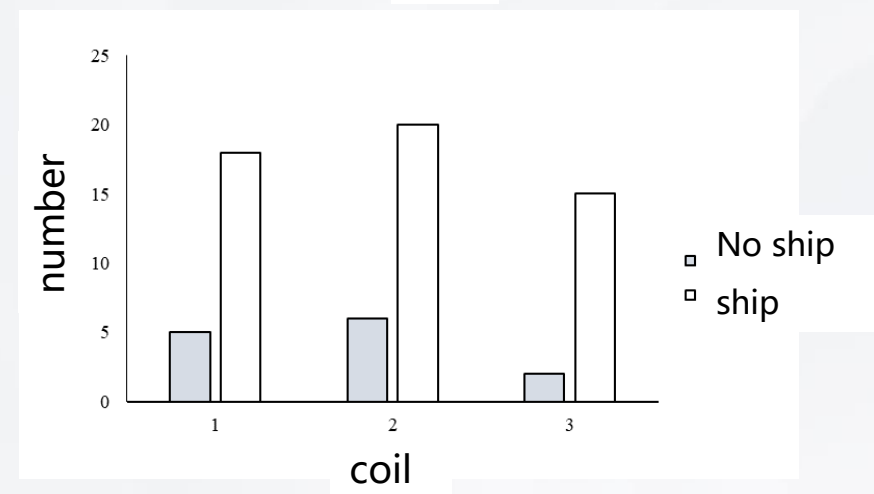
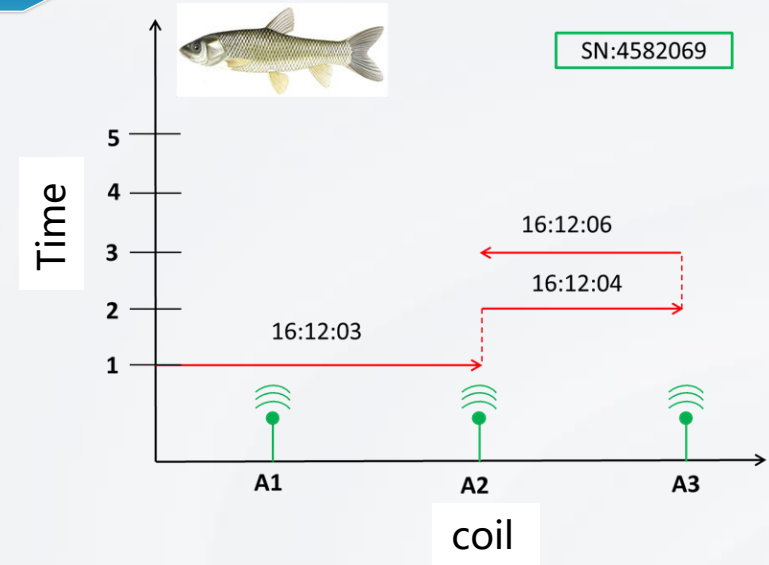
## 4 Experimental fish test :

- ◆ This study was carried out near Shilong South Bridge in the Dongjiang River
- ◆ Before the experiment, put the experimental cage into the position of about 20~40m, 50~70m and 80~100m from the main waterway of the ship and 10 fish were placed in each position
- ◆ After the experimental fish adapted to the experimental cage for 1 hour, the PIT telemetry system device was turned on and the experiment began. Each group was tested for 5min
- ◆ record the number of fish passing through the PIT coil when there is a ship passed by



## 1 Effects of ship on distribution of fish(20-40m) :

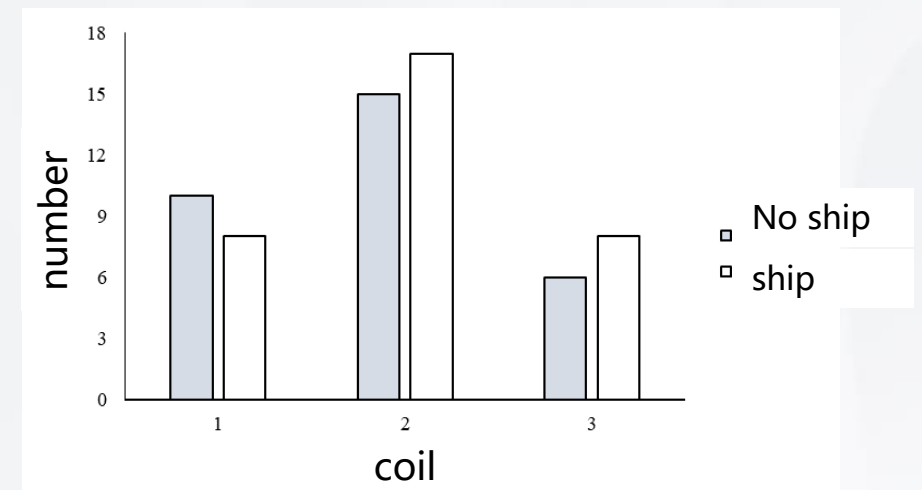
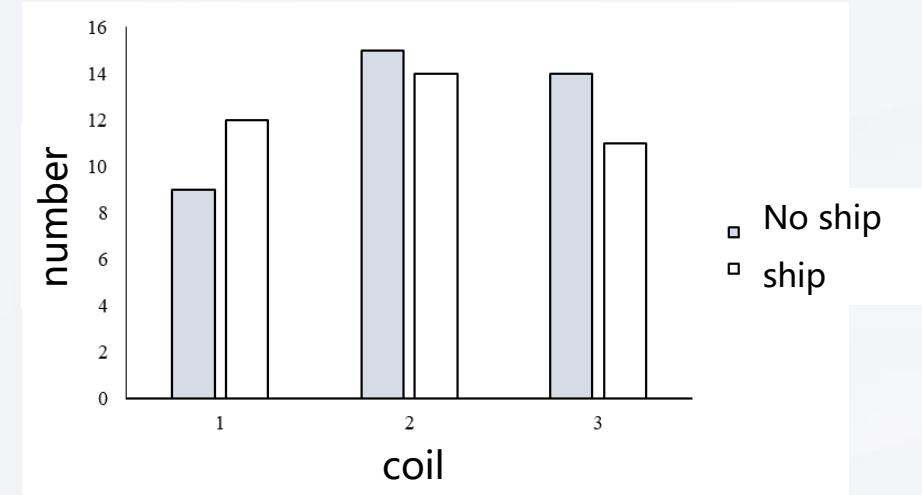
- ◆ The number of experimental fish passing through the three PIT coils was counted when the experimental fish were located in the main waterway of the ship 20~40m
- ◆ When no ship passes by, the number of fish passing through coils 1, 2, and 3 within 5 minutes is 5, 6, and 1
- ◆ When a 1,000-ton ship passes through, the number of fish that pass through coils 1, 2, and 3 within 5 minutes is 18, 20, and 15.





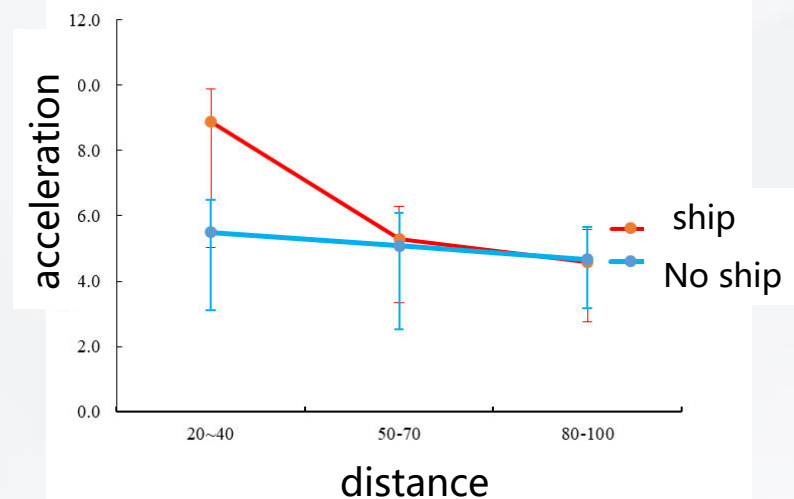
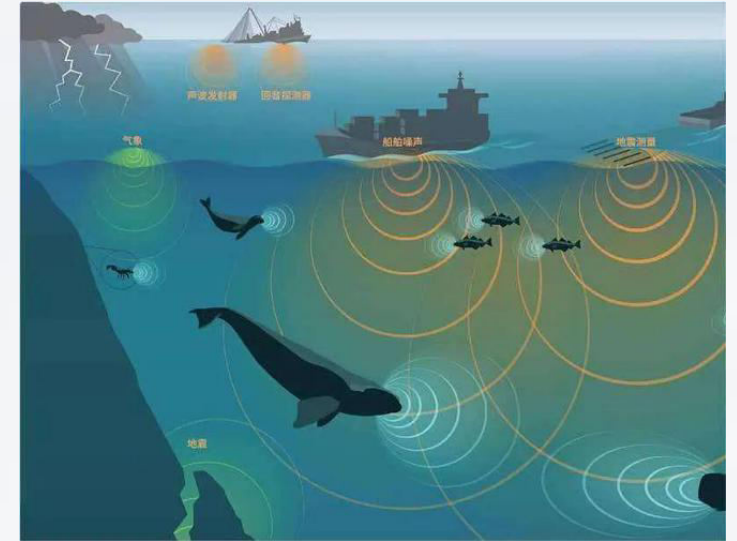
## 2 Effects of ship on distribution of fish (50-70m and 80-100m):

- ◆ From 50 to 70m away from the main waterway, the number of fish passing through coils 1, 2, and 3 within 5 minutes was 12, 14, and 11, and the number of fish passing through coils 1, 2, and 3 within 5 minutes was 9, 15, and 14 when no ship was passing
- ◆ The number of fish that passed through coils 1, 2, and 3 within 5 minutes was 8, 17, and 8 when there was a ship passing 80 to 100 meters away from the main waterway, and 10, 15, and 6 when there was no ship passing



### 3 Effects of passing ships on fish swimming speed :

- ◆ when the fish were 20~40m away from the ship, the swimming acceleration of the fish was  $5.50\text{m/s}^2$  without ship passing by and it was  $8.87\text{m/s}^2$  with a ship passing by.
- ◆ When the distance was 50~70m from the ship, the swimming acceleration of fish was  $5.08\text{m/s}^2$  without ship passing, and it was  $5.28\text{m/s}^2$  with a ship pass by.
- ◆ When the distance is 80~100m from the ship, the swimming acceleration of fish is  $4.67\text{m/s}^2$  without ship passing and it is  $4.58\text{m/s}^2$  with a ship



## Conclusion:

- ◆ Through field experiments, it is found that when the distance of fish from the ship is less than 40m, the acceleration of fish and the number of coils passing through the ship are higher than that without a ship
- ◆ When the distance of fish from the ship is greater than 40m, there is no significant difference between the acceleration of fish and the number of coils passed by the ship
- ◆ The influence of ship on fish is limited by the distance, and ship navigation in a certain distance will promote the escape behavior of fish, and the effect of ship on fish will be weakened

## Suggestion :

- ◆ In the future, more research on the response of fish in different noise environments can be carried out ,to provide support for fish ecological protection.



**Thank you !**