

## Fisheries Intelligence Report

2 October 2023

### Vessel Report - 150 vessels overview analysis

Report number	JAC-010
Report type	Research
Report subject	A group of Chinese-linked distant-water fishing vessels displaying high risk identity-change behaviour using MMSIs in the unofficial 150 series
Issue date	2 October 2023
Security notes	No confidential information

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A copy of this report was shared in draft with China Bureau of Fisheries to alert them to this vessel behaviour and provide them with an opportunity to respond and share their observations on the findings and possible action taken. This resulted in constructive dialogue over email and a remote meeting with staff from the China Overseas Fisheries Association (COFA) and Shanghai Ocean University, where information and views were exchanged. Confirmation was received that on at least one occasion when a vessel reporting an official Chinese identity over a 150 series MMSI was documented in Atlantic / Pacific squid grounds, COFA sources indicated that the authorised vessel was active in the Indian Ocean. COFA noted that an investigation is underway as a result. COFA stated that in general they would consider the vessels covered in this report that are transmitting over 150 series MMSIs to be stateless vessels. COFA also disputed that these vessels are linked to China, despite indications of the regular usage of Chinese ports and official Chinese series MMSIs and vessel names.

## Summary

A group of Chinese-linked distant-water<sup>1</sup> squid fishing vessels have been identified regularly transmitting over MMSIs in the 150 series (not assigned to any country) and engaging in complex behaviour involving regular name changes over AIS, sharing of names and MMSIs between vessels and transmission of multiple MMSIs from individual vessels. Whilst this behaviour alone does not constitute IUU, it does make it extremely challenging to monitor the number of individual vessels and the activities of these vessels using AIS and confirm their identities - a matter of concern for RFMOs, coastal States and port States that the vessels interact with during their operations.

The Joint Analytical Cell has produced three Fisheries Intelligence Reports (Intreps) focused on three MMSIs used by this group of vessels<sup>2</sup>. This complementary analysis investigates this operating pattern more broadly to determine its prevalence, identify any common patterns that could provide insight into the motivation for this behaviour, and identify the vessels and companies involved.

Analysis of the global usage of MMSIs in the 150 series over the period 2020-2022 found a significant portion being utilised on fishing gear or by vessels active only in the Chinese EEZ. A total of 225 individual 150 series MMSIs were identified that were likely to be associated with vessels active outside the Chinese EEZ. This included:

- 177 MMSIs that transmitted either no value in the 'name' identifier field, purely numeric values or basic letter combinations such as HHHH.
- Seven MMSIs that transmitted a single name that was seen transmitted only over that one MMSI, and these were considered less likely to be relevant to this analysis.
- 11 MMSIs were identified that clearly fit the pattern described (transmission of multiple names, all matching a small number of consistent name formats), of which only six had significant numbers of transmissions.
- A further 30 MMSIs that, based on analysis, were identified to have been used (minimally) by the same vessels.

These findings suggest that this pattern of behaviour is not widespread and, based on analysis of the vessels' movements on AIS and names transmitted, all of the vessels involved appear to be Chinese distant-water squid vessels. The vessels were active in the South Atlantic and Eastern Pacific squid fisheries, and a small number fished in the NPFC area in 2020, but not in subsequent years. This may be linked to the fact that three vessels in this group were IUU listed by NPFC in 2020, based on a sighting of unauthorised vessels fishing within the NPFC Convention Area by the Japanese Coast Guard.

The names transmitted included some that are a match for known, Chinese-flagged vessels and others that are not known from any records. The majority of the known vessel names utilised are in the LU RONG YUAN YU fleet, owned by Rongcheng Huadong Fishery Co Ltd, part of the Shidao Group. Smaller numbers of vessel names were linked to three other companies. All four of the companies have been linked to cases of proven or suspected IUU.

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<sup>1</sup> Distant water fishing vessels are those vessels that are operating outside of areas under the jurisdiction of their flag State or the State in which the vessels are registered. These vessels can often operate a substantial distance from the ports in which they are registered and spend a long time at sea.

<sup>2</sup> JAC-001: LUQINGYUANYU290 / LURONGYUANYU197 (MMSI 150402949); JAC-004: MMSI 150402947; and JAC-007: LU RONG YUAN YU 715 - available on request

Analysis of the 41 MMSIs associated with this operating pattern reveals some common operating patterns and trends. The LU RONG YUAN YU vessel names, the majority of which are listed as authorised vessels on the South Pacific Regional Fisheries Management Organization (SPRFMO) Record of Vessels, are used in the SPRFMO area, and vessel names in the FU YUAN YU series (including two which are a match for known vessels, and several that are unknown) are used in the Atlantic squid fishery. Names in the format SHUN HANG and HAI HANG, which may be informational transmissions, are used intermittently in all areas. Name changes are more frequent in the South Atlantic and also occur in and around some port visits and on transits. From the start of 2022 onwards, the majority of name changes are seen at times of the year when the squid fleet is moving between the Atlantic and Pacific fisheries. Name changes became less frequent over the course of the study period (2020 - 2022) and the usage of MMSIs in the 150 series also declined, although multiple vessels still appeared to be engaging in the basic pattern described and the pattern became more defined towards the end of the study period.

The motivation for this behaviour is unclear. While it makes sense that vessels would switch to transmission of authorised vessel names in the SPRFMO area, it is less clear why they would change to transmitting different names in the South Atlantic. The vessels involved also appear to be changing gear types as well as names between fishing grounds, with analysis of speed and vessel movements indicating that they are likely fishing with trawl gear in the Atlantic and jigging in the SPRFMO area (the gear type they are authorised to use in the SPRFMO Convention Area). All SPRFMO authorised vessel names transmitted over the 150 series MMSIs are authorised for handline or jig fishing.

A review of periods when vessels transmitting these MMSIs were operating in the SPRFMO area identified several occasions when a vessel was transmitting an authorised vessel name over an MMSI in the 150 series, and a second vessel was transmitting that same name over the associated official MMSI from a different location - generally somewhere between the Indian Ocean and within Chinese waters. This indicates that in at least some cases, the use of MMSIs in the 150 series has enabled the sharing of a single authorised vessel identity between two vessels in different locations. This is further corroborated by analysis of publicly available photos of the vessel LU RONG YUAN YU 715, which demonstrates that at least two different vessels have been documented using that name.

Some instances were identified where an MMSI in the 150 series, or an associated (based on transmitted names) official 412 series MMSI<sup>3</sup> appears to have been transferred between two different vessels. A check across all 41 MMSIs relevant to this study did not identify many high confidence instances where this occurred. One of the MMSIs was involved in episodes of spoofing - where it was simultaneously transmitted off two different vessels. This was challenging to detect as the two vessels were operating in close proximity and, during one of the episodes, were transmitting the same name (albeit with minor formatting differences) - suggesting that this may have been a coordinated activity. No instances of this spoofing behaviour were detected for other MMSIs in the 150 fleet, although transmission of the same MMSI from more than one vessel was detected for several of the associated 412 MMSIs. However, eyewitnesses have reported vessels in this fleet operating in very close proximity. Identifying MMSI transfers and spoofing between vessels operating in very close proximity, or where there are gaps between transmissions, is very difficult. This means it is not possible to accurately account for the extent to which MMSIs are being transferred or spoofed between vessels in the fleet.

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<sup>3</sup> MMSIs within the 412 series are assigned to Chinese flagged vessels.

Analysis of message types found that several (but not all) of the 150 and associated 412 MMSIs had transmissions over both type A and type B units. Whilst the detected spoofing episode did involve a vessel transmitting over type A, while another transmitted over a type B device, it is unclear whether variation in device type indicates transmissions from multiple vessels in all cases. In the case of at least one 150 MMSI, transmissions later in the study period demonstrated consistent location, speed and course but switched intermittently between type A and type B devices. In this case, the same name was transmitted, but otherwise different identifiers were transmitted on each device type. Whether this indicates one vessel transmitting over two or more AIS units, or transmission of the same MMSI by two vessels operating in very close proximity, is unclear.

Despite uncertainty around the specific motivation for the behaviour, the occasional transfer of MMSIs between vessels, as well as instances where a name was transmitted by one vessel over a 150 MMSI while another vessel was transmitting that name over the officially associated 412 MMSI from a different location, suggests that in at least some cases two vessels may be using MMSIs in this series to share an identity.

It is clear that this behaviour presents significant challenges to authorities seeking to monitor the activities of this fleet, both in terms of tracking vessel identities and histories (and resultant risk) over time, and for monitoring the number of vessels active in a fishery. Consequently, it is recommended that all of the vessel identities linked to this operating practice and all distant-water squid vessels transmitting over MMSIs in the 150 series should be considered high risk. On that basis, it is strongly recommended that such vessels are inspected should they seek to enter port, with a particular focus on confirming their identity, including through verification of vessel documents and confirmation of the AIS transponders onboard.

We encourage any partners that inspect the vessel/s to share with the Joint Analytical Cell (JAC) any information gained or results of their inspection so that our assessment may be updated. Assistance can be provided by the JAC to compile the reporting history for a vessel name or MMSI of interest to support a vessel inspection, and with the analysis of any findings from an inspection.

## Analysis

### High risk pattern of behaviour identified in previous analysis

The in-depth analysis of three MMSIs in the 150 series that were the focus of earlier JAC Intreps revealed a number of interrelated behaviours around transmission of vessel identities on AIS - some of which were seen regularly on all of the MMSIs analysed and some of which were seen only sporadically. The fundamental behaviour common to all of the analyses was the transmission of multiple, changing identities over MMSIs in the 'unofficial' 150 series, which is not assigned to any country. In all cases, identities transmitted over an MMSI included names associated with RFMO-authorized Chinese flagged vessels (sometimes multiple) as well as unknown vessel names. All of the transmissions appeared to originate from Chinese linked vessels active in distant-water squid fisheries, and the majority of the known vessel names were associated with a single Chinese distant-water fishing company.

RFMO-authorized vessel names appeared more likely to be transmitted in certain circumstances - visits to ports outside of China, transit through coastal States and upon entry to RFMO managed fisheries. One of the vessels was photographed on the Atlantic squid fishing grounds by the NGO Sea Shepherd providing evidence that, in at least one case, the vessel's name had been altered on the hull to match the change in name transmitted over AIS<sup>4</sup> (Figure 3).

Some of the official 412 series MMSIs associated with the transmitted names showed a similar pattern of name changes to that seen on the 150 MMSIs (including transmission of names not known from any official sources). However, AIS reporting patterns across the 150 and 412 MMSIs could vary, even when the same names were being reported. In some cases, it appears that a single vessel transmitted the same name on both the 150 MMSI and its officially allocated MMSI (in the 412 series assigned to China)<sup>5</sup>. In other cases, the same name was simultaneously transmitted on the 150 MMSI and official 412 MMSI from different parts of the globe<sup>6</sup>.

Instances were identified where an MMSI (both within the 150 and 412 series) appears to have transferred from one vessel to another, but in the initial studies there were no clear instances of spoofing found (where an MMSI is transmitted simultaneously from two or more vessels), suggesting that this sharing of an MMSI across multiple vessels was sequential and coordinated<sup>7</sup>.

Available photos of the RFMO authorised vessels whose names were transmitted indicate that the majority were not configured as traditional squid jigging vessels, with indications that some were operating with trawl nets, and some may be capable of operating with multiple gear types. This was borne out by AIS analysis, which indicated that the vessels switched gear type when moving from the Atlantic to the Eastern Pacific fishery.

Three of the MMSIs in this group have been linked to three vessels that were sighted in the NPFC Convention Area in July 2020 by a Japanese Coast Guard vessel and were subsequently IUU listed. The sighted vessels displayed the names LU RONG YUAN YU 197, 581 and 582 on their hulls (the first two names have both been transmitted over multiple MMSIs in this group through the study period). The MMSIs 150402940, 150402947 and 150402949 were active in the close vicinity of the sighting with no other vessels identified reporting on AIS in the vicinity. The latter two MMSIs were also transmitting names of two of the sighted vessels, indicating that these three MMSIs very likely originated from the IUU listed vessels during this period. It should be noted that all three of the vessel names corresponded to Chinese-flagged vessels that were authorised by China to operate within the NPFC Convention Area during 2020. However, Chinese authorities claimed that the sightings were not of the vessels authorised under those names, and the three vessels were IUU listed as stateless vessels<sup>8</sup>.

No further activities by any vessels in this fleet have been identified in the NPFC convention area subsequent to these sightings. This, along with the fact that MMSIs in the 150 fleet reported positions

<sup>4</sup> JAC-007: LU RONG YUAN YU 715 - available on request

<sup>5</sup> For example, from September 2021 412331284 and 150400453 have both transmitted the same names (including LURONGYUANYU 715, the name officially associated with 412331284) from the same vessel.

<sup>6</sup> For example, in June and July 2021, 150402947 transmitted the name LURONGYUANYU717 from the Pacific, while the official MMSI associated with that name - 412331285 - was enroute back to China from the northwest Indian Ocean, also transmitting LURONGYUANYU 717

<sup>7</sup> Brief periods of one MMSI being used on two vessels were subsequently identified, suggesting that this practice does at least on occasion form a component of this operating pattern - see this report section on 'MMSI transfer between vessels and spoofing'.

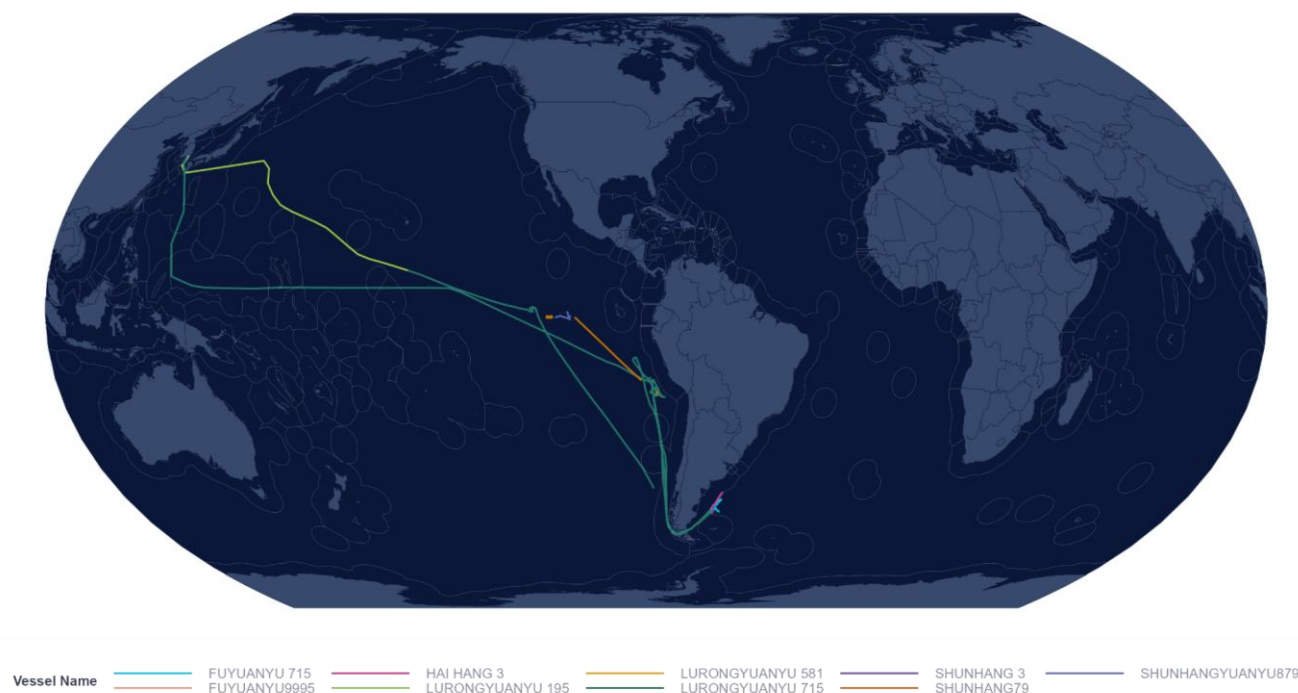
<sup>8</sup> Whilst the photos taken by the Japanese Coast Guard show vessels of very similar type to the NPFC authorised, Chinese flagged vessels, it was not possible to conclude definitively whether or not they show the same vessels.



both spatially and temporally consistent with and were the only MMSIs reporting on AIS in the vicinity of, the IUU vessels sighted by the Japanese Coast Guard, makes it almost certain that it was vessels within this fleet that were IUU listed. However, the complex identity changes over AIS make it extremely challenging to confirm which vessels within this fleet have been IUU listed.

### Case study: 150400453

The MMSI 150400453 was associated with the largest number of distinct vessel identities of the MMSIs analysed. This MMSI was observed to transmit at least 9 distinct vessel names<sup>9</sup> over the analysis period with frequent name changes observed (Figure 1).<sup>10</sup>



**Figure 1** Tracks of MMSI 150400453, 01 January 2020 to 31 December 2022. Vessel tracks are coloured by normalised vessel name. Vessel Name LU RONG YUAN YU 581 isn't displayed as there was only one transmission of this name.

There were some general patterns to the name changes observed for MMSI 150400453. These were:

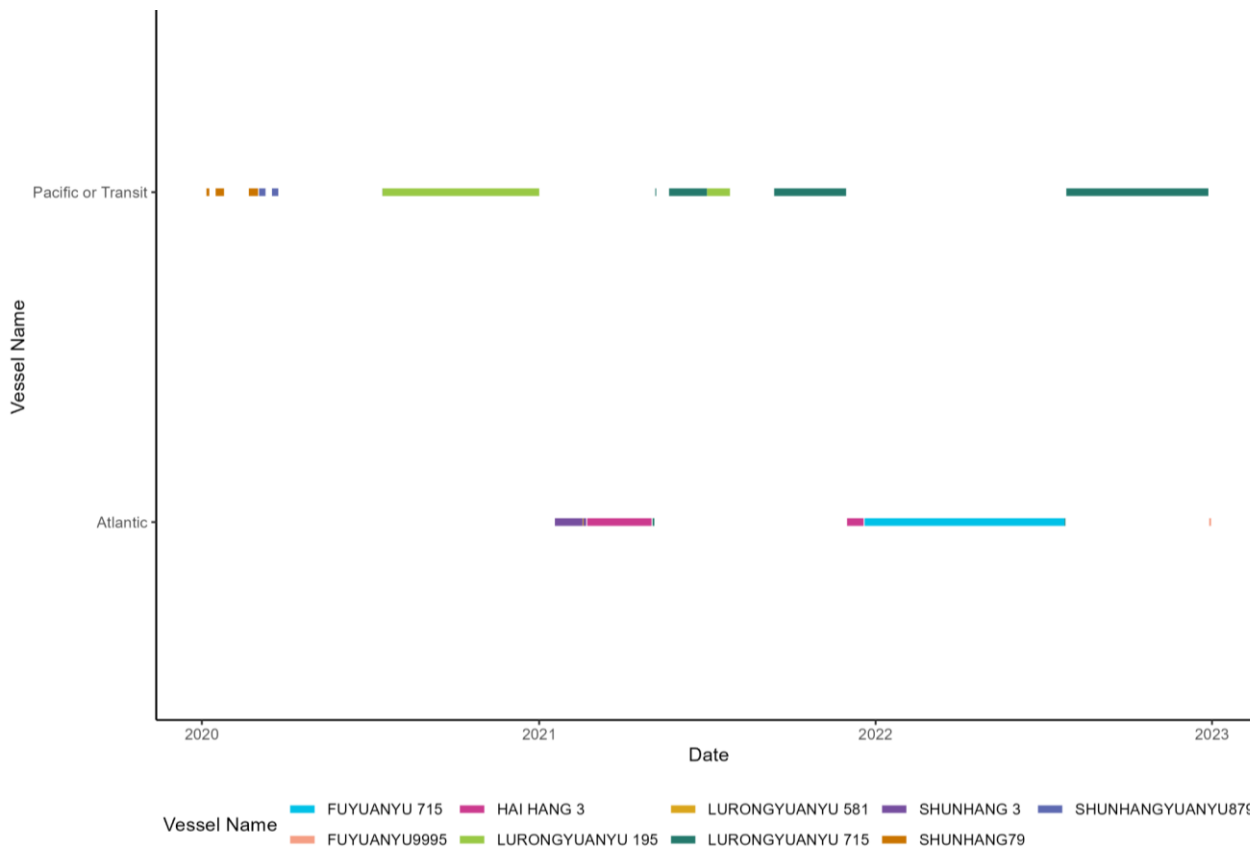
1. Transmission of names with the pattern LU RONG YUAN YU (715/195) whilst operating in the Pacific squid grounds and transiting back to port in China.
2. Transmission of names with the pattern HAI HANG (3) and FU YUAN YU (715/9995) while operating in the Atlantic squid grounds

Figure 2 illustrates the timing and duration of each name transmitted by MMSI 150400453. The name changes for this MMSI generally coincided with the vessel moving between fishing grounds, with the Atlantic season typically operating between December-January and June-July and the Pacific season

<sup>9</sup> Names have been 'normalised' to represent distinct patterns of vessel names, that is small changes in vessel name e.g., FUYUANYU 715 vs FU YUAN YU 715 have been considered the same AIS identity.

<sup>10</sup> Note that there is some discrepancy between AIS data providers in the names associated with MMSIs in this group, which may result from variations in signals received, combined with the short period of usage of some names.

operating between June-July to December-January. Name changes have been less frequent since the start of 2022 (Figure 2).



**Figure 2** - Timeline of the names transmitted by MMSI 150400453 between 01 January 2020 and 31 December 2022.

In February 2022, a Sea Shepherd vessel photographed the vessel transmitting this MMSI in the South Atlantic squid grounds. Photographs show that the name displayed on the vessel's starboard side had almost certainly been altered from LU RONG YUAN YU 715 to FU YUAN YU 715 (Figure 3). When it was sighted, the vessel was transmitting the name FU YUAN YU 715 on MMSI 150400453, as well as on the official MMSI associated with LU RONG YUAN YU 715 (412331284). This example demonstrates that the observed name changes are not only occurring on AIS but are likely being reflected across other vessel identifiers.





**Figure 3:** Close-up on the bow of the vessel transmitting in the South Atlantic in February 2022 as FU YUAN YU 715 (original image on left) and close-up annotated image on right showing the Chinese characters for “LU RONG” (black characters - added to the image) and the area where the character 鲁 (LU) can still be seen (yellow circle) despite having been painted over - Source: Sea Shepherd.

No clear instances were identified where MMSI 150400453 appears to have transferred between vessels during periods of regular transmissions. However, there were multiple gaps in transmission, including two that lasted for over a month, where a transfer between vessels is unlikely to be detected. So, whilst it is possible that, in this case, all of the names associated with this MMSI were transmitted from the same vessel - potentially the LU RONG YUAN YU 715, as indicated on the hull (and the name transmitted most frequently) - it is not possible to say this conclusively. It should be noted that for much of this period, 150400453 appears to have been transmitted from the same vessel as MMSI 412331284 (the official MMSI associated with LU RONG YUAN YU 715). However, during October 2022 412331284 was also transmitted by a vessel transiting from China into the squid fishing grounds in the northwest Indian Ocean (whilst 412331284 and 150400453 were simultaneously active in the Pacific) indicating that at least two different vessels have used identifiers associated with LU RONG YUAN YU 715.

This was corroborated by the China Overseas Fisheries Association, who confirmed that on the occasion in 2020 when a vessel using this name was photographed in Punta Arenas, Chile (see vessel images in figure 12 below), records held by Chinese authorities indicated that the genuine LU RONG YUAN YU 715 was in fact operating in the Indian Ocean.

## Scale and distribution

Analysis was conducted to identify all 150 series MMSIs with similar or related patterns of usage during the three-year period from 01 January 2020 to 31 December 2022. This analysis sought to determine whether the behaviour outlined above (based on analysis of three MMSIs only) was widespread or limited to a small number of vessels, and identify the vessel types, identities and owners involved.

All data from MMSIs in the 150 series was extracted for the three-year study period. The 150 MMSI prefix is commonly used for AIS units attached to fishing gear because this is not an official Maritime Identification Digit (MID) associated with a country. In an effort to remove AIS associated with fishing gear, any MMSI which transmitted a vessel name or call sign including ‘%’, ‘V’, ‘-’, ‘Net’, which are

strong indicators of likely gear association, was dropped from the analysis. The secondary step was to remove activity from MMSIs that were only active within the Chinese EEZ, as this activity, whilst widespread, was deemed unrelated to the operating pattern under investigation. These steps resulted in 225 MMSIs that were unrelated to fishing gear and active outside of the Chinese EEZ.

The resultant list of 225 MMSIs included 177 MMSIs that transmitted either no value in the 'name' identifier field, purely numeric values or basic letter combinations such as HHHH. This left 48 MMSIs that transmitted at least one value recognisable as a potential name. Of these 48 MMSIs, 11 were identified that transmitted multiple potential name values<sup>11</sup> - indicating that the complex MMSI usage outlined in the original reports is linked to some additional MMSIs and vessels, but not large numbers. A further 30 MMSIs were identified that only transmitted a single name but were considered to be associated with this operating pattern as that name had also been transmitted over at least one of the 11 multi-name MMSIs. The remaining seven MMSIs had transmitted a single name that was seen only over that one MMSI. This group of seven includes four MMSIs that transmitted non-Chinese vessel names and did not show links to China based on operating area / port visits - suggesting that MMSIs in this series are occasionally used by vessels outside the Chinese fleet, although this practice does not appear to be widespread<sup>12</sup>. These seven MMSIs were considered less likely to be relevant to this analysis so were excluded, resulting in a final identification of 41 MMSI's that were considered potentially relevant (henceforth, the '150 fleet') to vessels displaying the subject behaviours discussed earlier in this report.

Of the 41 MMSIs in the '150 fleet', there were only six with more than 10,000 transmissions during the three-year study period. The remainder had less than twenty transmissions each, indicating that the majority were used for only very limited periods, and some may have been the result of MMSI transmission errors. There were two MMSIs with more than 100,000 transmissions, and the most used MMSI was 150402944 with over 180,000 positional transmissions and ten distinct names transmitted during the three-year study period. This suggests that the vessels engaging in this practice are utilising a relatively small number of 150 series MMSIs that are linked to multiple identities, as well as a larger number that are used for short periods or only infrequently and may transmit only a single identity.

This overview analysis identified vessels with a 150 MMSI prefix operating in the Atlantic and Pacific squid fisheries and frequently changing identity. To check if there were any other vessels with this behaviour, but utilising MMSIs in series other than 150, all vessels operating in the Atlantic and Pacific squid grounds on AIS were identified. Vessels transmitting on MMSIs with MIDs not associated with countries were examined to see if they behaved in similar fashion to the 150 MMSI fleet. A number of vessels transmitting on a 200 series MMSI were identified, however they maintained a consistent AIS identity and therefore were not considered to be related to the behaviour outlined in this report.

## Distribution

The AIS activity of the 150 fleet is reasonably consistent throughout the analysis period with the majority of activity on AIS observed in the Atlantic and Pacific squid fishing grounds, as well as transits between

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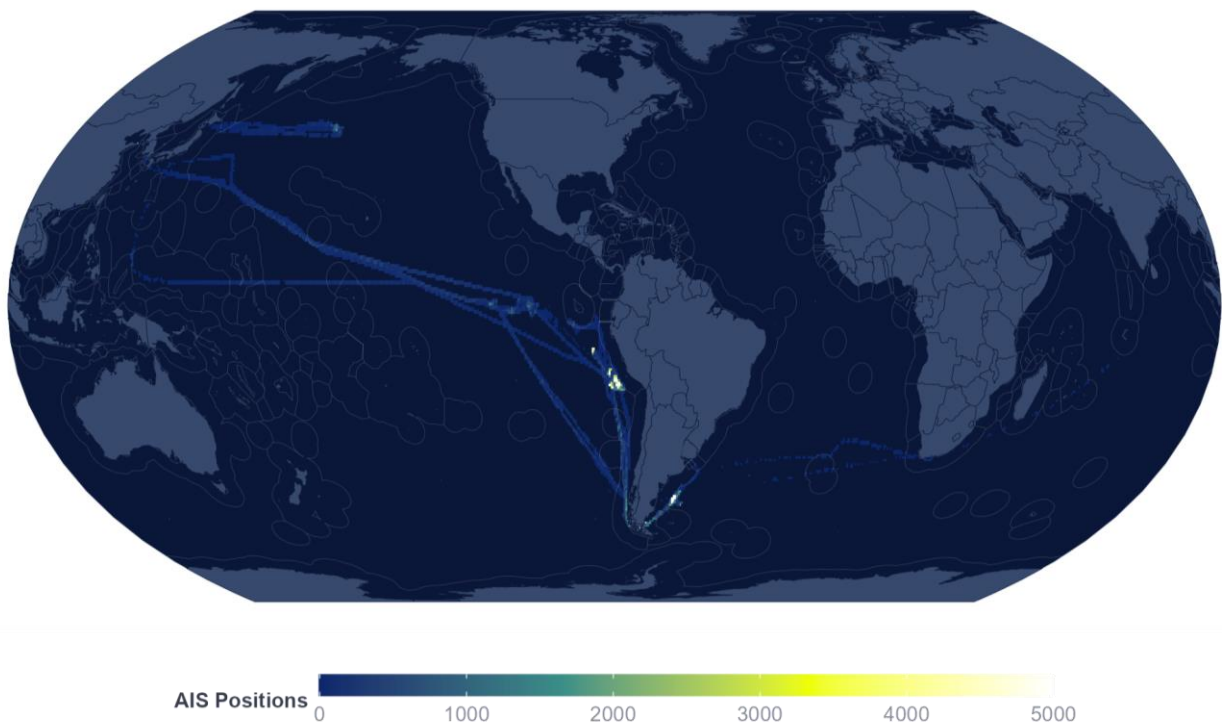
<sup>11</sup> For the purpose of analysis, formatting variations and minor spelling variations/potential typos were ignored, so that e.g., FUXHHNYU 715 and FUYUANYU 715 were assumed to represent the same name, as they were transmitted over the same MMSI, and the former name value was not transmitted a high number of times.

<sup>12</sup> These included a platform supply vessel, flagged to Nigeria and operating in the Gulf of Guinea, two unidentified vessels operating in the EEZ of Indonesia (South Papua province), and an unidentified vessel transmitting from the Persian Gulf (EEZ of Saudi Arabia)

these locations through the Strait of Magellan, and to likely home ports in Shandong province, China. There has been AIS activity observed consistent with likely fishing activity in three high sea's locations:

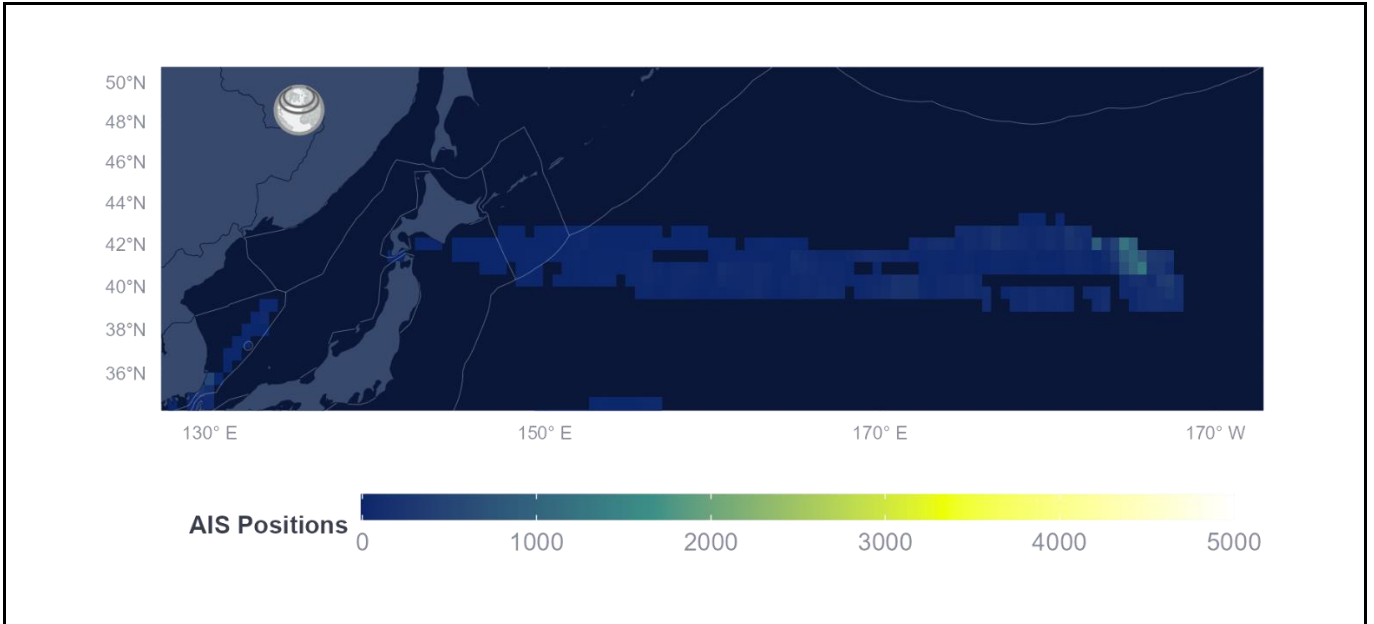
1. North Pacific - This location, around 2000 nautical miles east of Japan, was fished by three members of the 150 fleet in June and July 2020 before returning to port (Figure 4, Figure 5). This was the only time the fleet has fished in this location - it should be noted that vessels in this group were sighted by the Japanese Coast Guard in the NPFC Convention Area in 2020, resulting in IUU listing (see earlier 'high risk pattern of behaviour' discussion) - this incident may explain why the fleet does not appear to have returned to this area.
2. Southeast Pacific - This is a relatively large area from east of the Galapagos to the high seas to the south of the Peruvian EEZ (Figure 4, Figure 6). Vessels operate in this location typically between June and December
3. Southwest Atlantic - Adjacent to the Argentinian EEZ and north of the Falkland Islands/Malvinas. Vessels typically operate in this area between December and May (Figure 4, Figure 7).

The 150 fleet were observed to make regular transits back to China, predominantly across the Pacific. The port activity was predominantly in Wangjia Bay, Shidao Bay, and Rongcheng Bay which are all located in Shandong province, in an area home to a large number of distant-water squid fishing companies<sup>13</sup>. Outside of China the fleet was observed making port calls in Busan, South Korea; Singapore, Singapore; Punta Arenas, Chile; and Montevideo, Uruguay.

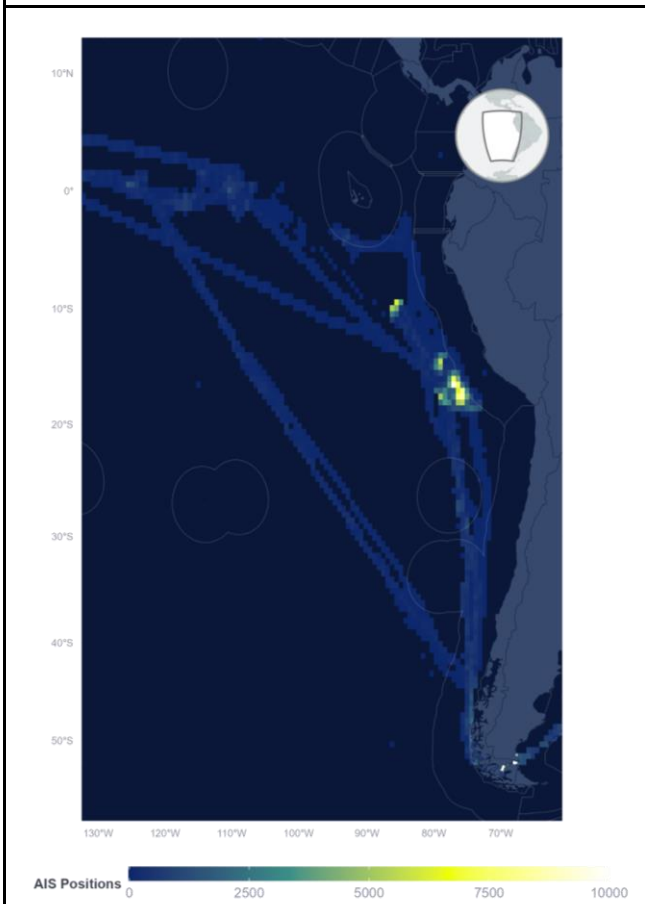


**Figure 4** - Global heatmap of AIS position density illustrating the global distribution of AIS activity from vessels in the 150 series between 01 January 2020 and 31 December 2022, AIS positions are aggregated within 0.5 x 0.5-degree latitude and longitude cells.

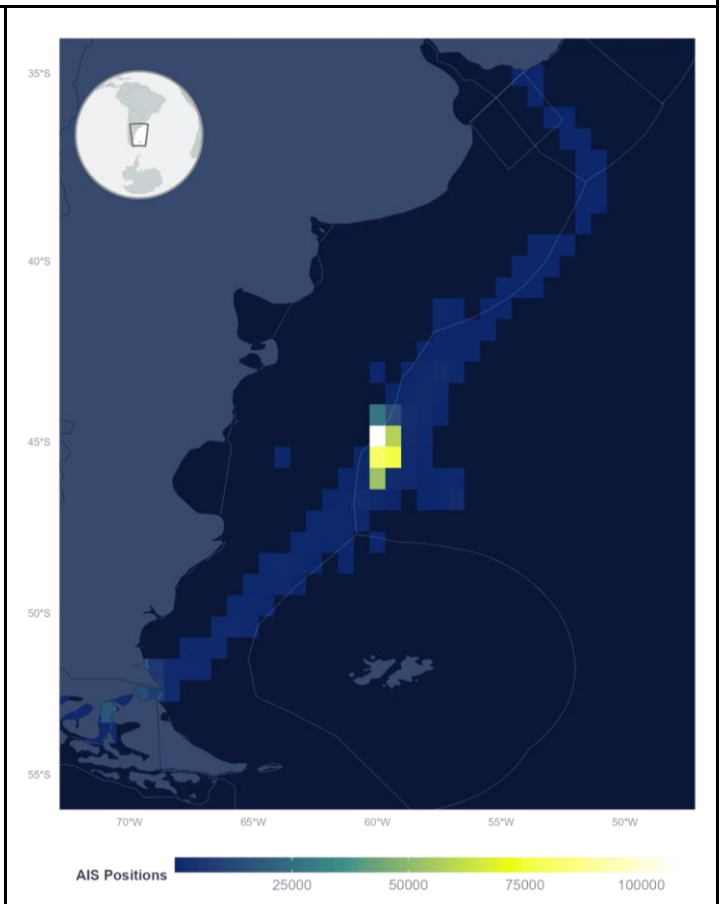
<sup>13</sup> One MMSI was observed making port visits to Hong Kong - however as a significant time was elapsed between these and this MMSI appearing on the squid fishing grounds, it is unclear if the Hong Kong port visits were associated with a vessel in the 150 fleet or not.



**Figure 5** - North Pacific heatmap of AIS position density illustrating the distribution of AIS activity from vessels in the 150 series between 01 January 2020 and 31 December 2022, AIS positions are aggregated within 0.5 x 0.5-degree latitude and longitude cells.



**Figure 6** - Southeast Pacific heatmap of AIS position density illustrating the distribution of AIS activity from vessels in the 150 series



**Figure 7** - Atlantic heatmap of AIS position density illustrating the distribution of AIS activity from vessels in the 150 series between 01 January 2020



between 01 January 2020 and 31 December 2022, AIS positions are aggregated within 0.5 x 0.5-degree latitude and longitude cells.	and 31 December 2022, AIS positions are aggregated within 0.5 x 0.5-degree latitude and longitude cells.
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## Vessel identities

The name values transmitted by vessels in the 150 fleet can be grouped into several categories, with several MMSIs transmitting names in two or more categories:

- Names associated with known Chinese flagged vessels – names of Chinese distant-water fishing vessels known from official sources, including the SeaWeb database of vessels with IMO numbers, RFMO authorised vessel lists and national sources. 32 MMSIs transmitted at least one name associated with a known Chinese fishing vessel, and eight of these transmitted two or more known Chinese vessel names.
- Potential default or informational transmissions - seven MMSIs transmitted one or more variant of the ‘name’ SHUN HANG XX (including one that only transmitted the name SHUNHANG1) and ten MMSIs transmitted one or more variant of the name HAI HANG XX (including four that transmitted only that name value). Both of these ‘name’ types may represent an informational or default setting – the phrase HAI HANG in Mandarin indicates a vessel sailing on the sea (as opposed to inland waters); SHUN HANG translates approximately to smooth journey, and in addition Shenzhen Shunhang Navigation Tech Co. Ltd is a Chinese manufacturer of AIS transponders, so it is possible that transmission of that name may also be informational, or represent something like a default setting on units from that manufacturer. It should be noted that two of the nine ‘SHUN HANG’ name values that were transmitted during the study period do correspond to the names of known vessels – SHUN HANG 6 and SHUN HANG 68, both squid vessels owned by Zhoushan Shunxing Blue-Waters Fisheries Co Ltd, although the vessel currently named SHUN HANG 68 was named JIA DE 12, and under different ownership, during the period when that name was transmitted over an MMSI in the 150 series<sup>14</sup>, suggesting that this may be a coincidence.
- Potential Chinese vessel names that are not a match for any known vessels – nine different name values were transmitted over 11 MMSIs which appear to be potential Chinese vessel names but for which no match was found in official records. These included multiple names in the series FU YUAN YU XX and LU QING YUAN YU XX, as well several others (for the full list, see Annex). The majority of these names were transmitted over MMSIs that were associated with multiple identities, but three MMSIs transmitted only a single Chinese vessel name that was not known from official sources (FU YUAN YU 715). However, it should be noted that China’s full distant water authorisation list has not been published by the Chinese Ministry of Agriculture and Rural Affairs since 2020<sup>15</sup>, so it is possible that there are some authorised Chinese distant-water vessels that are not known from the currently available sources (i.e. if not authorised to an RFMO and do not appear in the SeaWeb database as they do not have an IMO number).

<sup>14</sup> The name SHUNHANG68 was transmitted over MMSI 150402947 from January to April 2020, but during that time the authorised vessel currently named SHUN HANG 68 was named JIA DE 12 (sources indicate it was renamed in December 2022).

<sup>15</sup> Independent of vessel authorisation lists made available by or through RFMOs in which Chinese vessels are fishing.

## Known Chinese-flagged vessels

13 Chinese vessel names known from official sources were transmitted by a total of 32 MMSIs in the 150 series, with 9 of the names being transmitted by two or more MMSIs. Ten of these names are associated with squid vessels authorised to fish in the Convention Areas of the North Pacific Fisheries Commission and/or South Pacific RFMO – including seven vessels in the LU RONG YUAN YU series, owned by Rongcheng Huadong Fishery Co Ltd; one vessel in the LU RONG YUAN YU series, owned by Rongcheng Homey Ocean Fishing Co Ltd; and two vessels in the SHUN HANG series, owned by Zhoushan Shunxing Blue-Waters Fisheries Co Ltd (though, as mentioned above, it is likely these names represent generic SHUN HANG transmissions, and it is a coincidence that the numbers match genuine vessel names).

Of the remainder – one name (LU RONG YUAN YU 20) is a match for a formerly WCPFC-authorised tuna longliner, owned by Shandong Lidao Oceanic Technology Co Ltd – although this name has been transmitted for only brief periods, from MMSIs that are present in squid, rather than tuna, fishing grounds – suggesting that it may be an incomplete rendering of a different name, e.g. LU RONG YUAN YU 20X or similar<sup>16</sup>. Two names are a match for vessels in the FU YUAN YU series and are both owned by Fujian Hengli Fishery Co Ltd. These vessels are not authorised to fish in any RFMOs and are known only from IMO records. Very few transmissions have been received over the official Chinese-series MMSIs associated with these vessels but these do include at least one positional transmission from both of the MMSIs from the squid grounds of the south Atlantic<sup>17</sup>, as well as transmissions by FU YUAN YU 9993 from the EEZ of Oman and by FU YUAN YU 9995 from the squid grounds of the eastern Pacific. China Overseas Fisheries Association indicated that neither of these vessels is authorised to operate on the high seas and they are not configured to target squid. Therefore, they disputed that the authorised vessels, FU YUAN YU 9993 and FU YUAN YU 9995, would have been operating in the areas from which these transmissions were received.

## Ownership

### Rongcheng Huadong Fishery Co Ltd

The majority of Chinese authorised vessel names linked to the operating pattern described here are owned by Rongcheng Huadong Fishery Co Ltd, which is a fully owned subsidiary of Shidao Group Co. Ltd<sup>18</sup>. Shidao Group is a conglomerate, with shareholdings in eight fisheries companies (including Rongcheng Huadong) and involvement in a number of sectors, including port operations, processing, shipyards, construction, aquaculture and real estate<sup>19</sup>. The group is based in Shidao New Port in Rongcheng, one of China's largest squid fishing and processing centres<sup>20</sup>.

<sup>16</sup> Communications from the China Overseas Fisheries Association confirmed that the LU RONG YUAN YU 20 was scrapped in 2017, which is consistent with its most recent RFMO authorisation terminating in 2016.

<sup>17</sup> FU YUAN YU 9993 was also included on a list of foreign fishing vessels detected adjacent to the Argentine EEZ as of November 2022, reportedly provided by the Argentine Prefectura Naval to a seafood publication based in Buenos Aires - although it is unclear whether this was based on a real or AIS sighting, and if the latter whether it referred to transmissions over the official MMSI 412440716 or an MMSI in the 150 series. See [https://issuu.com/redes-seafood/docs/redes\\_seafood\\_233](https://issuu.com/redes-seafood/docs/redes_seafood_233)

<sup>18</sup> China Corporate Registry

<sup>19</sup> [http://nyj.weihai.gov.cn/art/2020/4/30/art\\_24461\\_2311983.html](http://nyj.weihai.gov.cn/art/2020/4/30/art_24461_2311983.html)

<sup>20</sup> <https://www.china-squid.com/article.html?type=info&id=37234>



The majority shareholder of Shidao Group, controlling 51% of shares, is Yin Yuanhua<sup>21</sup>, who is also listed as the Chairman of the Board of Directors<sup>22</sup>.

Vessel databases, including the most recent available distant-water authorisation lists published by China Ministry of Agriculture (2020), link Rongcheng Huadong Fishery Co Ltd to 13 squid vessels and one refrigerated cargo vessel<sup>23</sup>; with a number of other vessels linked directly to Shidao Group, although this information may be outdated as the company is no longer authorised to directly operate distant-water fishing vessels<sup>24</sup>.

Five vessels have been IUU listed by NPFC, based on two separate sightings by the Japanese Coast Guard in 2017 and 2020, that share names with vessels owned by Rongcheng Huadong / Shidao Group: LU RONG YUAN YU 787 and 797 in 2017 and LU RONG YUAN YU 197, 581 and 582 in 2020. In both cases, China's Ministry of Agriculture reported that the sighted vessels had different characteristics to the NPFC authorised vessels owned by Shidao Group, so the IUU listing proceeded on the assumption that these were stateless vessels assuming the identity of vessels owned by the Shidao Group<sup>25</sup>. Photo analysis of the vessels sighted in 2020 by the Japanese Coast Guard operating in the NPFC Convention Area, along with AIS analysis for associated MMSIs, was not able to confirm whether or not the sighted vessels were a match for those owned by Shidao Group. However, it could also not rule this out.

Rongcheng Xinlong Aquatic Products Co Ltd, which is 75% owned by Shidao Group, is the registered owner of LU RONG SHUI 158. A vessel using this name was included on the NPFC IUU list based on a sighting in the Convention Area in 2018, that confirmed it was operating whilst not on the list of authorised vessels<sup>26</sup>.

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<sup>21</sup> China National Enterprise Credit Information System

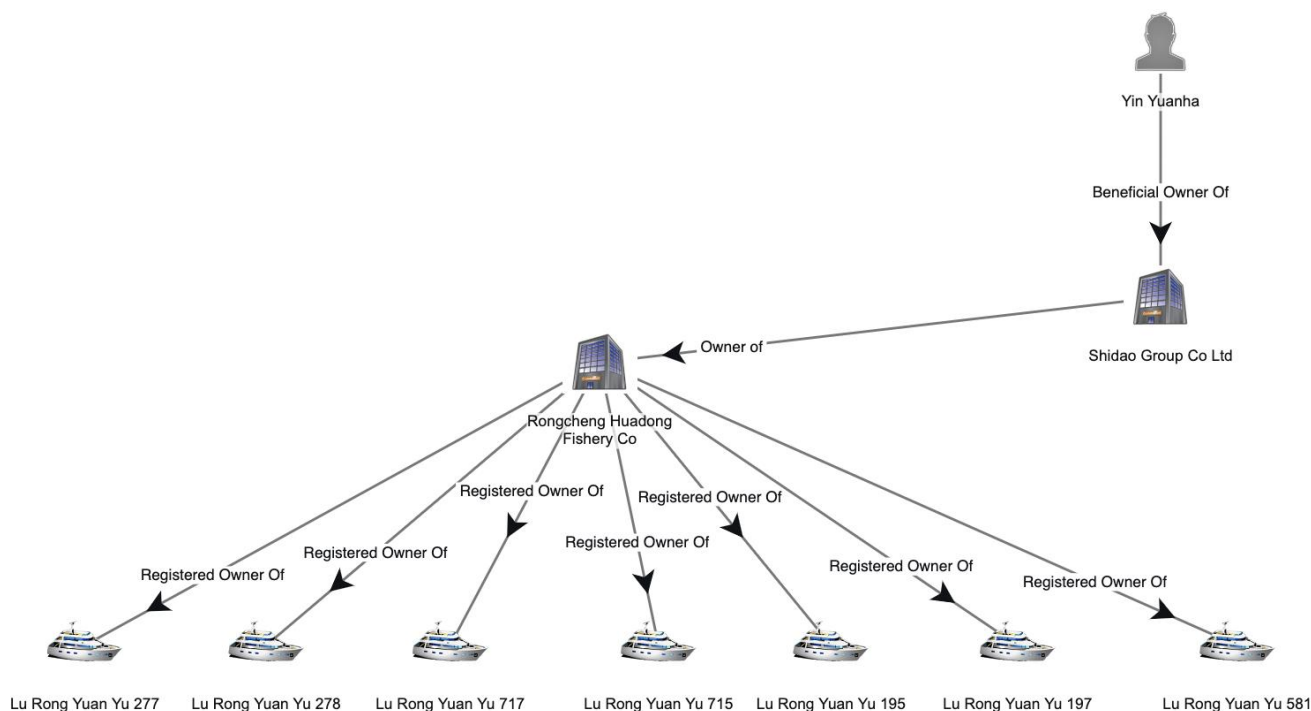
<sup>22</sup> China Corporate Registry

<sup>23</sup> A second refrigerated cargo vessel was reportedly sold in 2020 although it is unclear whether the new registered owners are also connected to Shidao Group

<sup>24</sup> [http://www.moa.gov.cn/nybgb/2019/201907/202001/t20200106\\_6334339.htm](http://www.moa.gov.cn/nybgb/2019/201907/202001/t20200106_6334339.htm)

<sup>25</sup> [http://www.moa.gov.cn/nybgb/2018/201806/201809/t20180904\\_6156764.htm](http://www.moa.gov.cn/nybgb/2018/201806/201809/t20180904_6156764.htm) and NPFC IUU list

<sup>26</sup> Note that this vessel was identified as stateless in the NPFC IUU list and the China Overseas Fisheries Association indicated that the authorised LU RONG SHUI 158 was in Chinese domestic waters at the time of the sighting, although it should be noted that the IUU listing data indicates that the vessel was transmitting the official Chinese MMSI associated with LU RONG SHUI 158 (412688540) at the time of sighting.



**Figure 8** - Beneficial ownership of Rongcheng Huadong Fishery Co Ltd, listed as the registered owner of seven vessel names in the 150 fleet.

### Rongcheng Haodangjia Ocean Fishery Co Ltd

One of the multiple vessel names transmitted over MMSI 150402944<sup>27</sup> was LU RONG YUAN YU 601, which is a squid jigger owned by Rongcheng Haodangjia Ocean Fishery Co Ltd. This company, also based in Rongcheng, is listed as the owner of eight distant-water squid fishing vessels, including LU RONG YUAN YU 606, which reportedly fled a request for boarding and inspection by Uruguay in 2022, resulting in detention<sup>28</sup>. The same vessel was reported to have fled an attempted boarding or been detained (reports are contradictory) in the Argentinean EEZ in 2020<sup>29,30</sup>. The director and primary shareholder of Rongcheng Haodangjia are individuals named Zhang Yongren and Song Huatong.<sup>31</sup>

Unlike the Rongcheng Huadong-owned vessel names engaged in this behaviour, the name LU RONG YUAN YU 601 was only transmitted over one MMSI (150402944) and over a period of only four days in late January to early February 2023. The transmissions were interspersed with transmissions of a different vessel name (FU YUAN YU 9993), with indications that two different vessels operating in relatively close proximity were transmitting this MMSI during this period (see 'MMSI transfer between vessels' discussion below).

<sup>27</sup> This occurred in early 2023, so just outside the main study period, but still of relevance to this report.

<sup>28</sup> <https://en.mercopress.com/2022/07/05/uruguayan-navy-arrests-chinese-jigger-which-tried-to-flee-arrest>

<sup>29</sup> <https://www.lacapitalmdp.com/prefectura-detuvo-a-un-buque-pesquero-chino/> and <https://pescachubut.ar/la-historia-detras-de-la-pesca-ilegal-en-el-litoral-maritimo-argentino/>

<sup>30</sup> The China Overseas Fisheries Association disputes that one or both of these incidents occurred.

<sup>31</sup> Chinese corporate records

## Fujian Hengli Fishery Co Ltd

Two of the vessel names linked to the subject behaviour of this report are associated with vessels owned by Fujian Hengli Fishery Co Ltd. One of these names was transmitted over four different MMSIs, the other over only one, although that MMSI transmitted multiple names. Unlike the other named vessel owners, this company is not based in Rongcheng but in Pingtan, Fujian Province. It should be noted that no port calls were observed in Pingtan or the wider Fujian Province by the 150 fleet.

This company is fully owned by an individual named Zhang Suiming, who is also the Executive Director and Manager<sup>32</sup>. Fujian Hengli is linked to a fleet of at least forty vessels, including trawlers operating in West Africa as well as distant-water squid vessels. One of the vessels owned by this company, the FU YUAN YU 379, was observed fishing outside its licensed area and found to be operating with illegally adjusted nets during a 2017 joint patrol by Guinean authorities and the NGO Greenpeace, resulting in a fine<sup>33</sup>. This reportedly led to the cancellation of fuel subsidies to the vessel in September 2017<sup>34</sup>.

## Zhoushan Shunxing Blue-Waters Fishery Co Ltd

Two of the vessel names linked to the behaviour outlined above are associated with vessels owned by Zhoushan Shunxing Blue-Waters Fishery Co Ltd (also known as Zhoushan Shunhang Ocean Fisheries Co Ltd). These names - SHUN HANG 6 and SHUN HANG 68 - are in a format that matches a number of other unknown 'names', which could represent an informational or default setting (see above). In addition, whilst the authorised Chinese vessel SHUN HANG 6 has been under that name since it was built in 2013, SHUN HANG 68 was previously (prior to December 2022) named JIA DE 12 and under the ownership of a different company, so the transmission of that name over an MMSI in the 150 series (in 2020, prior to the official name SHUN HANG 68 coming into use) is likely to represent a coincidence. Therefore, it is considered less likely that this company is linked to the 150 fleet.

Zhoushan Shunxing Blue-Waters Fishery Co Ltd, based in the port of Zhoushan, is majority owned by an individual named Xu Feng<sup>35</sup>.

An unofficial report suggests that four vessels owned by this company have been involved in IUU fishing incidents in Argentina during the period 2015 - 2019, although the detail and original source for this information is not known<sup>36</sup> and this claim has been disputed by Chinese officials<sup>37</sup>.

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<sup>32</sup> S&P Global / IHS Markit

<sup>33</sup> <https://fcwc-fish.org/other-news/chinese-vessels-caught-with-illegal-fishing-bounty>

<sup>34</sup> <https://www.greenpeace.org/international/press-release/15209/chinese-companies-see-subsidies-cancelled-and-permits-removed-for-illegal-fishing-in-west-africa/>

<sup>35</sup> China Corporate Registry

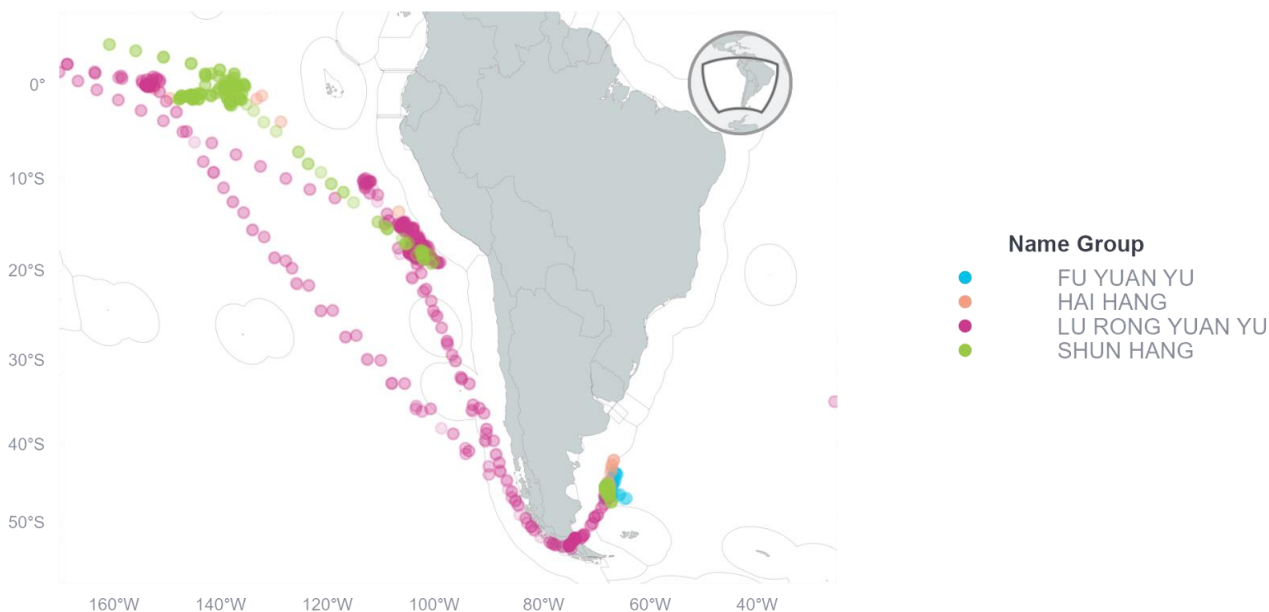
<sup>36</sup> <https://ejfoundation.org/resources/downloads/The-Ever-Widening-Net-2022-final.pdf>

<sup>37</sup> China Overseas Fisheries Association disputes this report based on their communications with the company and also claims that there are no official Chinese records of these IUU incidents.

## Observations

### Name changes

The vessels in the 150 fleet have been observed to have a consistent behaviour in relation to their usage of different name patterns. The majority of the official names associated with RFMO registries are of the pattern LU RONG YUAN YU XXX. These names are utilised when operating in the Pacific squid grounds, where activities are regulated through SPRFMO and where they are authorised under those names. These names are also generally used whilst transiting between fishing grounds and to port locations (Figure 8). There were eight days of LU RONG YUAN YU XXX transmissions observed in the Atlantic squid grounds (compared to 934 days of transmissions of other names) and generally these were short periods upon arrival to the area and before changing to another name. The names SHUN HANG and HAI HANG were used sporadically in both the Pacific and Atlantic squid grounds. The name pattern FU YUAN YU was used exclusively when the 150 fleet were operating in the Atlantic squid grounds (Figure 9).



**Figure 9** - Average daily positions of the 150-fleet coloured by the name group of the vessel between 01 January 2020 and 31 December 2022.

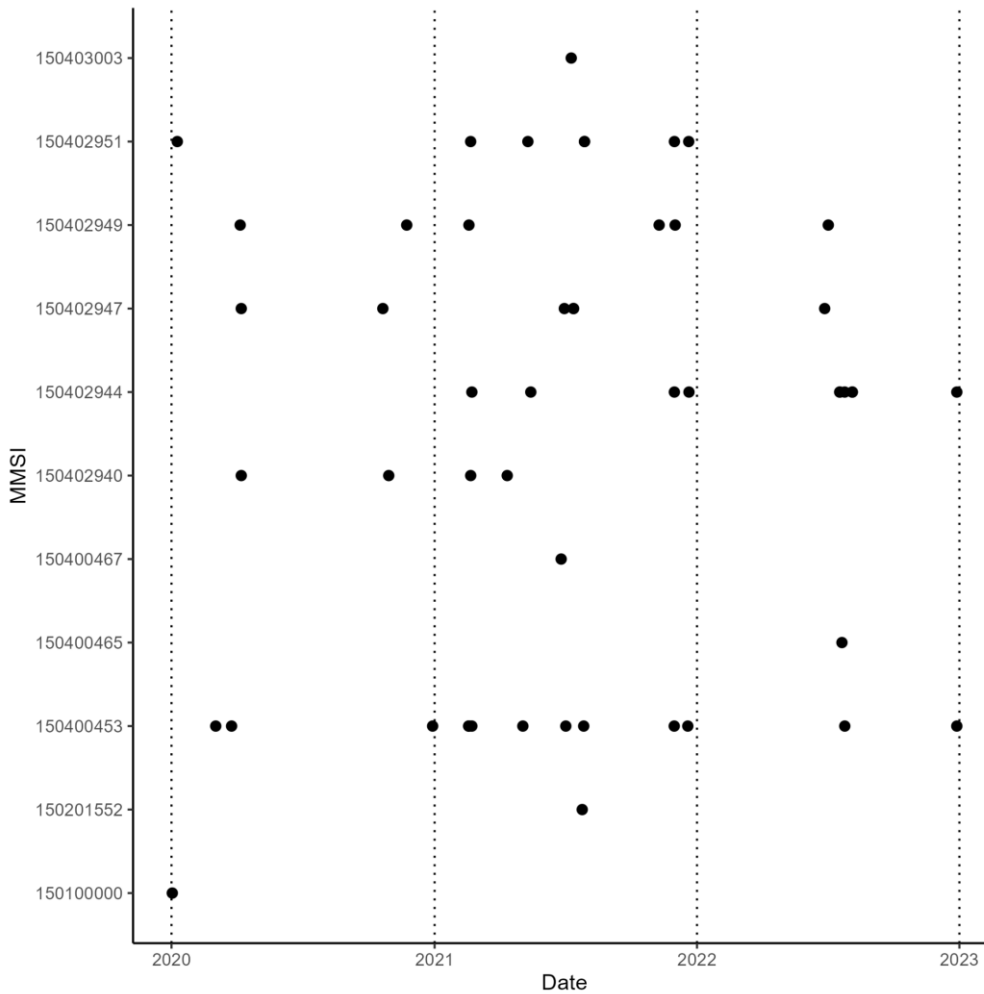
Figure 10 demonstrates that there was some consistency in the locations where there was a change in the name transmitted by the 11 MMSIs that transmitted multiple names during the study period. A high proportion of name changes occurred within or adjacent to the Atlantic squid grounds and name changes were also observed in or close to various ports, indicating that on some occasions vessels changed name prior to port visits. Name changes were also commonly observed in the high seas in locations and at speeds consistent with the MMSI being in transit, in some cases prior to entering an EEZ. The combination of these observed locations suggest that name changes are occurring in a deliberate

manner, so vessels have stable identities for entry into ports, whilst moving within EEZs and while operating in fisheries regulated through an RFMO.



**Figure 10** - Locations of significant identity changes observed in the 11 MMSIs of the 150-fleet observed to change identity on AIS between 01 January 2020 and 31 December 2022.

The name changes observed in the 150 fleet were more frequent earlier in the analysis period, with 40 name changes occurring in the first 18 months of the three-year analysis period, compared to 11 name changes in the last 18 months (Figure 11). This pattern is generally consistent with usage trends at the MMSI level with fewer MMSIs active later in the analysis period, coupled with less frequent name changes (Figure 11). Since 2022, the timing of name changes has typically coincided with vessel movements between fishing grounds which occur in December and/or January, as well as June and/or July (Figure 11).



**Figure 11** - Timings of significant name changes observed in the 11 MMSIs of the 150-fleet observed to change name on AIS between 01 January 2020 and 31 December 2022.

## Gear

The members of the 150 fleet of vessels were observed to operate differently in the Atlantic squid grounds and the Pacific squid grounds. The activity in the Atlantic appears consistent with the vessels likely using a trawl gear, based on the vessels' speed and pattern of operations on AIS. This is supported by observations by the NGO Sea Shepherd, which in February 2022 observed members of this fleet trawling on the Atlantic Squid grounds. In contrast, in the Pacific fishing grounds the vessels' speed and pattern of movement on AIS is consistent with squid jigging. Based on available photos (see Figure 12), vessels in this fleet are capable of operating with both trawl and jig fishing gear, although a modification in vessel configuration is required. The use of trawl gear on these vessels requires a crane or boom to manoeuvre and lift the net, whereas squid jigging utilises conveyors which are located around the vessel perimeter and extend over the side to operate squid jigs (Figure 12).





**Figure 12** - LU RONG YUAN YU 715 observed in Punta Arenas, Chile in June 2020 (top) configured for squid jigging and configured for trawling in November 2021 (bottom)<sup>38</sup>.

An example of the difference in speed and AIS activity can be seen in the AIS track for MMSI 412331284 - the official MMSI associated with LU RONG YUAN YU 715 (see Figures 13 & 14)<sup>39</sup>. In the Atlantic squid grounds, the vessel operates in a relatively discrete area which extends over 100 nautical miles parallel to the Argentinian EEZ boundary (Figure 13). In this area the vessel's fishing activity is characterised by:

- speeds of 3-4 knots for periods of 5 to 10 hours;
- then a short period of speeds less than 2 knots, during which they may be retrieving gear;
- followed by a short period of high speed, greater than 5 knots, to relocate the vessel.

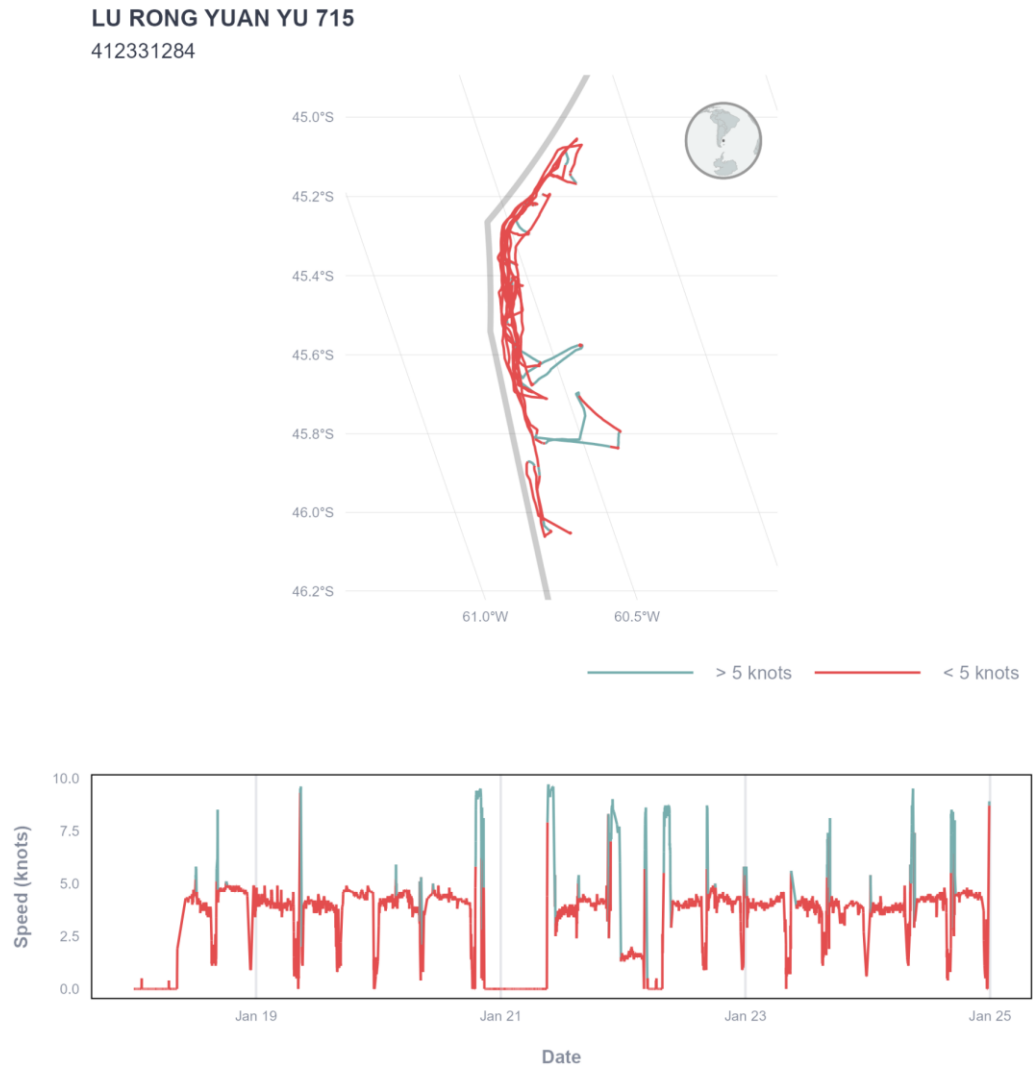
This pattern of activity is assessed as consistent with behaviour displayed by trawl vessels. In the Pacific squid grounds, the vessel operates across a very wide area (around 850 nautical miles wide) outside the Peruvian EEZ (Figure 14). In this area the vessel's fishing activity is characterised by:

- speeds of 0.5-1 knots for periods of 6 to 48 hours;
- followed by a short period of high speed, to relocate the vessel.

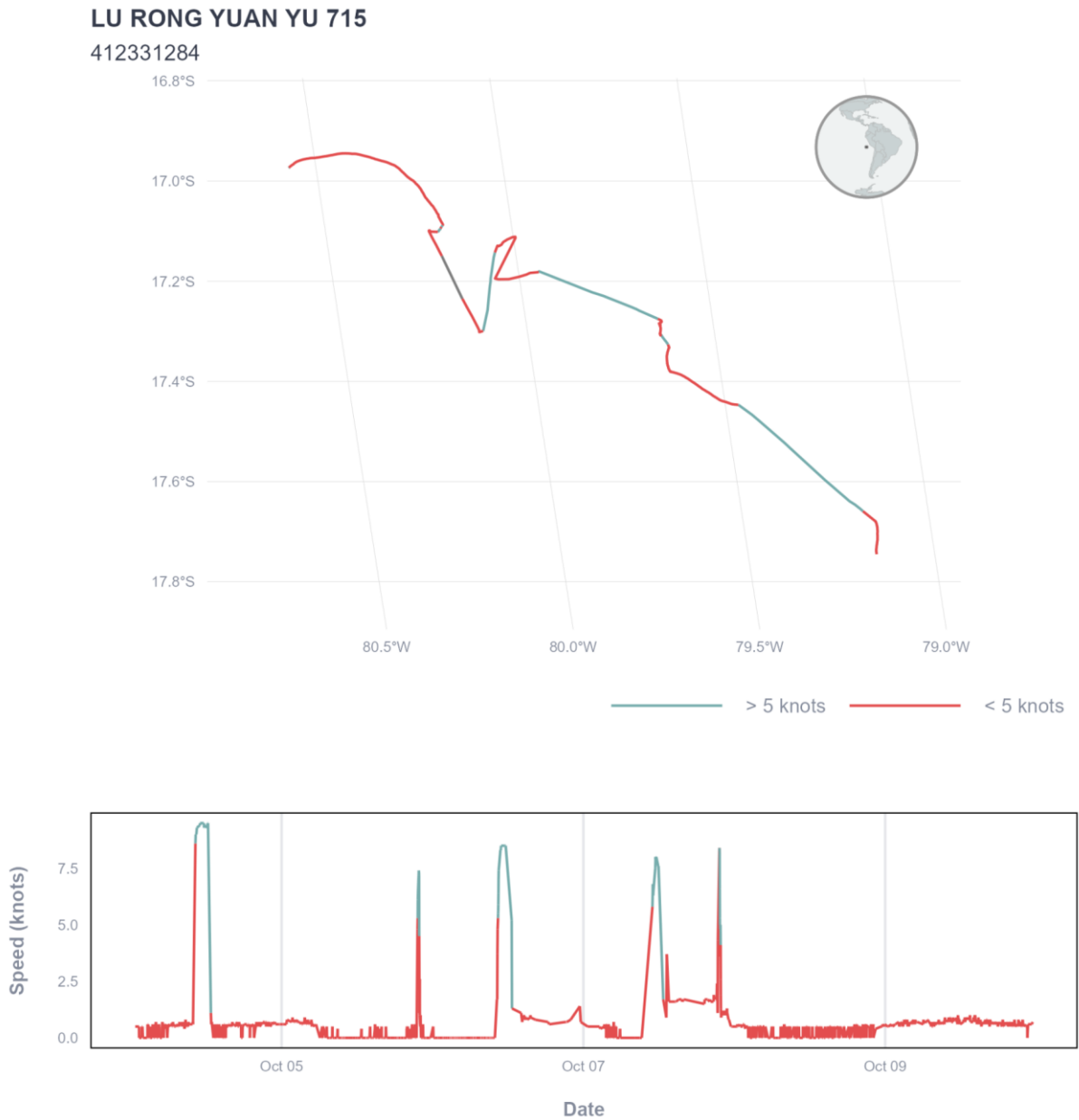
This pattern is consistent with squid handline or jig fishing.

<sup>38</sup> The China Overseas Fisheries Association has indicated that at the time the first of these photos was taken, official Chinese records indicated that LU RONG YUAN YU 715 was in the Indian Ocean, suggesting that the vessel shown in the photograph was not the genuine LU RONG YUAN YU 715. No transmissions were received from the official Chinese MMSI associated with LU RONG YUAN YU 715 (412331284) during 2020.

<sup>39</sup> During this period, the vessel appears to have been simultaneously transmitting over 412331284 and the unofficial MMSI 150400453, with the same pattern of speed and operations seen on both.



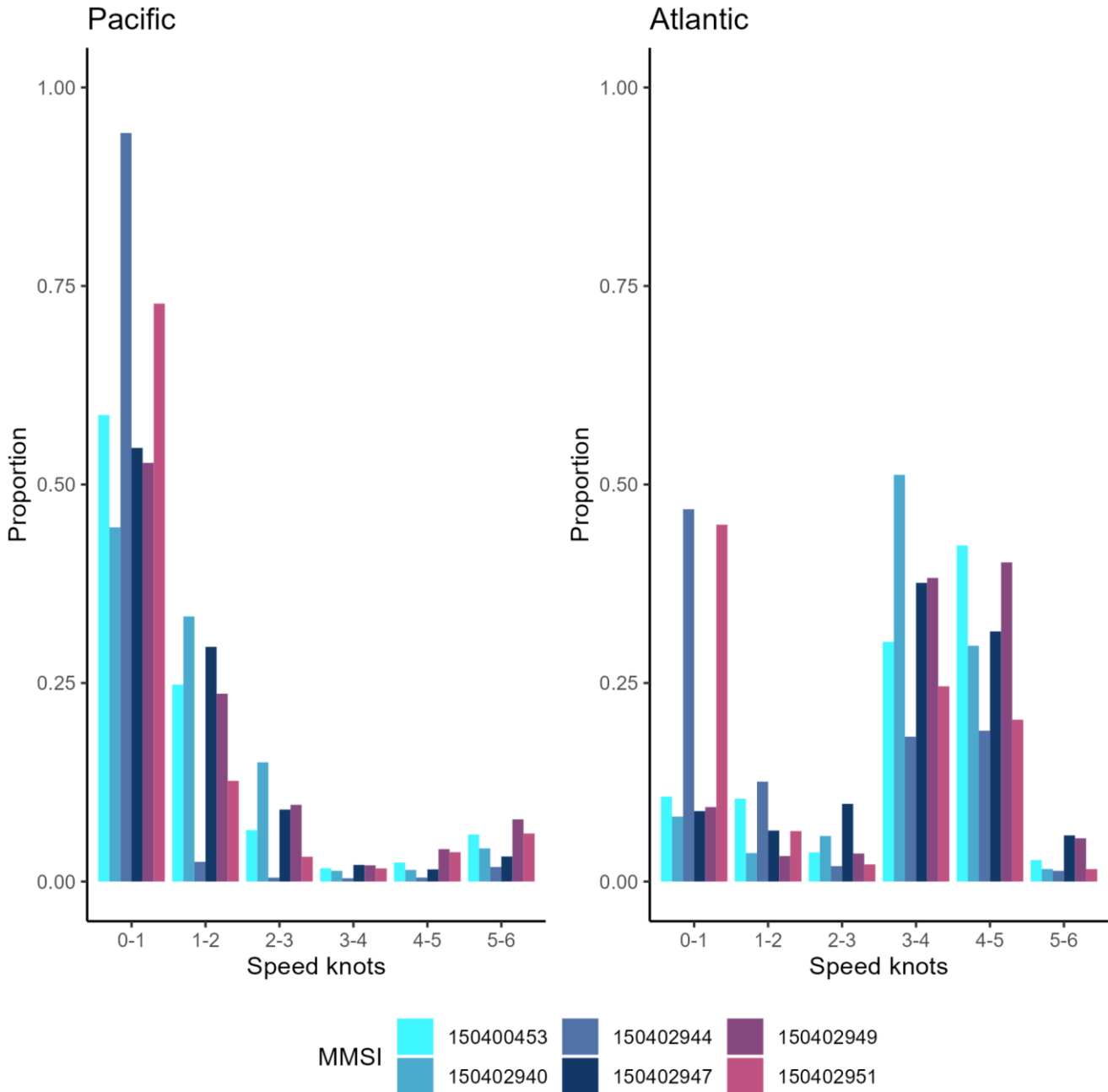
**Figure 13** - Map and speed profile example of one week of fishing activity by 412331284 (presumed LU RONG YUAN YU 715) when operating in the Atlantic squid fishing grounds between 18 January 2022 and 24 January 2022. The vessel's track is coloured red when below 5 knots and green when above 5 knots.



**Figure 14:** Map and speed profile example of one week of fishing activity by 412331284 (presumed LU RONG YUAN YU 715) when operating in the Atlantic squid fishing grounds between 04 October 2022 and 10 October 2022. The vessel's track is coloured red when below 5 knots and green when above 5 knots.

To assess the prevalence of this gear change across the fleet the six MMSIs that were used consistently through the analysis period were evaluated to examine the speed of their AIS activity in the Pacific squid grounds compared to the Atlantic squid grounds. The speed of operations was generally around 0-1 knots in the Pacific squid grounds across the fleet; this speed is consistent with squid handline or jig fishing (Figure 15). In contrast the speed of operations was much higher in the Atlantic squid grounds with all vessels spending a large proportion of their time at speeds between 4-6 knots, consistent with

trawl activity (Figure 15). The exceptions to this were MMSIs 150402944 and 150402951 which both had significant effort at low speeds in the Atlantic grounds. A further examination of the AIS tracks associated with these MMSIs indicated that these vessels had activity consistent with both trawl and squid jigging in the Atlantic squid grounds during the study period.



**Figure 15** - The proportion of positions at each speed in the Pacific (left) and Atlantic (right) squid fishing grounds, between 0-6 knots, for the six MMSIs most active on AIS in the 150 fleet between 01 January 2020 and 31 December 2022.

The catalyst for this change in gear between the two fishing grounds is unknown, however possible motivations for the behaviour identified in this fleet is discussed in more detail in the later section titled “Possible drivers for this behaviour”.

## Transmission types

Transmissions over 150 series MMSIs in this group include transmissions reported to originate from both type A and type B AIS transponders. AIS units are either type A or type B units and can generally only transmit messages that align with the type of device. Therefore, where one MMSI is transmitted over both message types intermittently, this could indicate a single vessel with multiple AIS units on board or could indicate that MMSI is being transmitted by multiple vessels (perhaps operating in close proximity, where there are no clear indications of simultaneous transmission from different locations). Analysis of two 150 series MMSIs reveals two different patterns of transponder type transmissions.

150402951 changed from type B to predominantly type A transmissions sometime on 4 December 2021 (commencing shortly after a transmission gap of several months and a change of name - from LU RONG YUAN YU 278 to HAI HANG 2). From the first type A message, static transmissions began to include a callsign and IMO (which had not previously been present) and the length and breadth values changed. Several days after this, the name changed again to FU YUAN YU 9994. The vast majority of subsequent transmissions on this MMSI were reported as type A (with just 12 positional transmissions detected from a type B transponder) until it ceased transmitting in February 2022.

Similarly, 150402944 was transmitting consistently on type B until 4 December 2021 when it began to report type A (note that this change occurred around the same timeframe as with MMSI 150402951 noted above). However, this was followed by an extended period during which both type A and type B messages were transmitted regularly. As in the example given above, the type A transmissions had different length and breadth values and included a callsign and IMO; the type B transmissions had smaller vessel dimensions and no callsign or IMO. The same name was transmitted across both types throughout, including several name changes mirrored across both message types.

In both of the above examples, the type B and type A transmissions originated from locations in close proximity - indicating that they could have been from the same vessel, or from two different vessels operating in close proximity. Of the 11 MMSIs within the 150 fleet which changed identities, 5 MMSIs were observed to use both type A and B transmissions, although only the above two MMSIs used both class A and class B devices extensively with other MMSIs having fewer than 10 class A transmissions, and 6 MMSIs only transmitted type B messages.

This behaviour was also examined for the 12 412 MMSIs associated with the 150 fleet. Of these 12 MMSIs, 1 transmitted only class A message types, 2 MMSIs transmitted only class B message types, and the other 9 vessels transmitted both class A and class B message types. There was no consistency observed in class A and class B AIS usage in the 412 fleet.

The explanation for the changes in message type outlined above is not known, but these examples illustrate that vessels in this group are displaying unusual patterns of message type transmission, in addition to the unusual patterns of name transmission and MMSI usage.

## MMSI transfer between vessels, spoofing and identity sharing

### MMSI transfer between vessels

Analysis of 150 series MMSIs and the associated MMSIs in the official 412 series (corresponding to the vessel names that are transmitted), reveals instances where an MMSI is almost certain to have been transferred from one vessel to another.

For example, from 2021 to present MMSI 150402949 appears to have been transmitted from the same vessel as 412331281 (the official MMSI allocated to LU RONG YUAN YU 197), based on analysis of position, time, speed and course of transmissions. However, analysis indicates that in February 2018, although both were transmitting from the South Atlantic, they were not on the same vessel. Following a significant gap in transmissions, 412331281 then commenced transmitting in October 2019 from the port of Shidao, while 150402949 was simultaneously active in the Eastern Pacific. This suggests that one or the other of these MMSIs was transferred between vessels at some point between October 2019 and 2021.

On 16-17 June 2022, a 20-hour AIS gap was observed for 150402949 in the South Atlantic, with an implied vessel speed based on distance travelled of 20 knots - faster than the maximum expected transit speed for a vessel of this type. This suggests that the MMSI was again transferred between vessels on this occasion. When 150402949 recommenced transmissions it was on a vessel transiting east across the Atlantic on the return journey to China - this vessel was travelling in a group of 3, with vessels transmitting on 412221070, 412331285 and 412336962.

Interestingly, MMSI 412331285 also appears to have transferred between vessels around this time. From December 2021 to June 2022, analysis indicates that this MMSI was transmitted from the same vessel as MMSI 150402947 - with both MMSIs transmitting the name FUJUANYU717 during a period of operations on the South Atlantic fishing grounds. 412331285 ceased transmissions on 29 June 2022 and was next detected on 7 July 2022, transmitting its officially associated name, LU RONG YUAN YU 717, from a location inside the South African EEZ. Based on the time and distance elapsed, it is not possible that the vessel transmitting 412331285 from the South African EEZ is the same one that was transmitting that MMSI from the South Atlantic. Further to this, analysis indicates that the vessel transmitting 412331285 from the South African EEZ had transmitted the name LU RONG YUAN YU 717 over a different 412 series MMSI - 412221070 - whilst transiting the Atlantic<sup>40</sup>.

AIS gaps greater than 24 hours were assessed across all MMSIs in the 150 fleet and related 412 MMSIs to test whether impossible gaps (indicating likely transfer between vessels) were common. Impossible gaps were identified by evaluating the distance between the location of the gap start and the gap end, then calculating the vessel speed required to move between these locations. If the necessary speed exceeded the known maximum speed of the vessel, then this was indicative of the MMSI shifting between vessels rather than the vessel moving between locations. With the exception of one other impossible gap taking place close to a port in China, no others were found, indicating that transfer between vessels may not be common. However, this approach would not identify transfers in which less than 24 hours elapsed between old and new vessel transmissions. It would also not identify cases where the two vessels involved were close enough to appear as if the transmissions could have originated from

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<sup>40</sup> This MMSI is not associated with any vessel in official sources and the China Overseas Fisheries Association has confirmed that it is not allocated to an authorised Chinese vessel.



the same vessel, or where the AIS reporting gaps were large enough to make this calculation arbitrary (such as the month-long gaps mentioned earlier in the report). So, the true prevalence of this behaviour is not currently known.

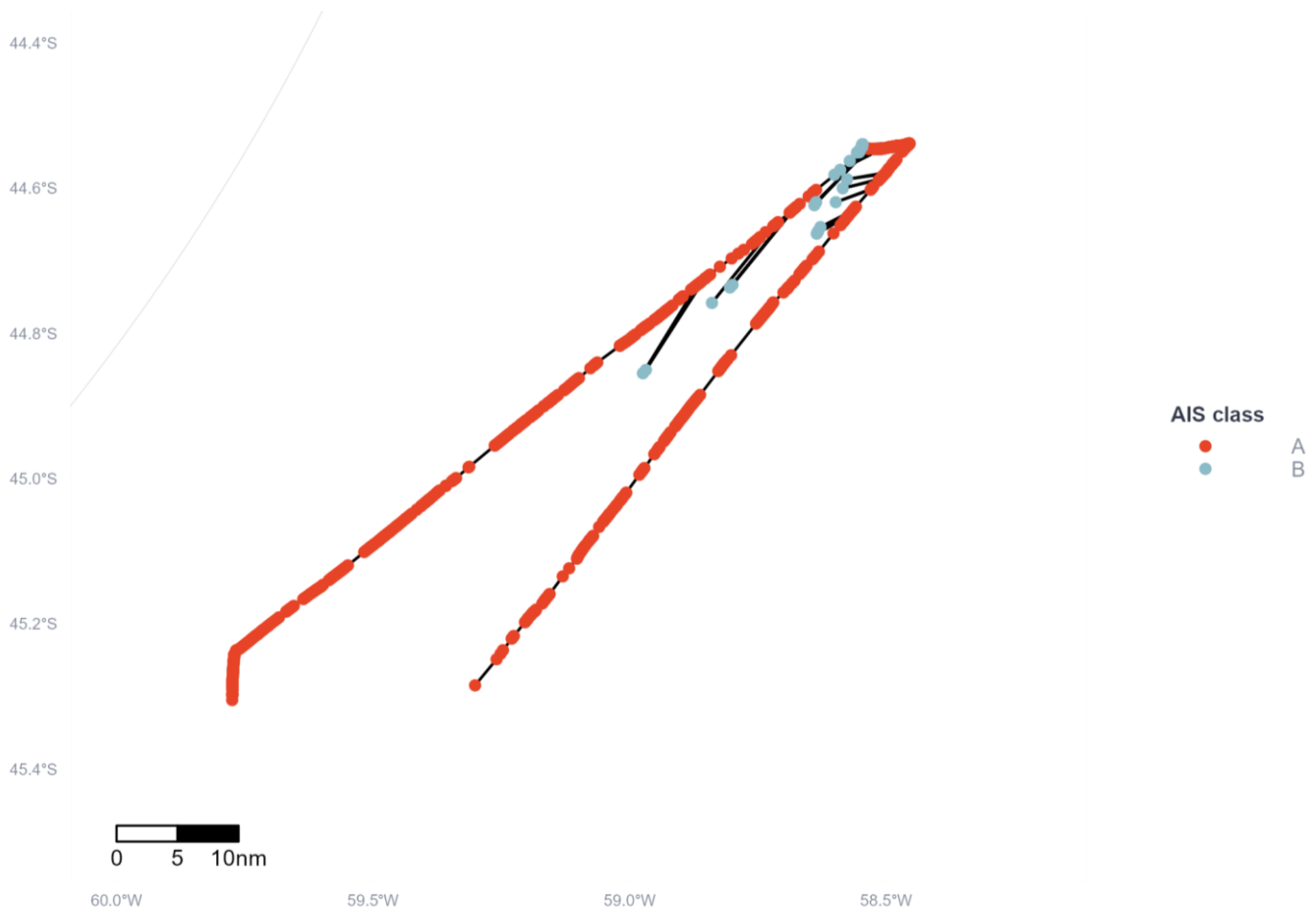
## Spoofing

The original three analyses of vessels in the 150 fleet did not identify clear instances of spoofing (where an MMSI is used simultaneously by two or more vessels) - suggesting that the frequent name changes observed did not stem primarily from MMSI sharing by vessels. In order to assess the representativeness of this finding, the presence of spoofing<sup>41</sup> was examined across the 150 fleet. This analysis found one MMSI (150402944) that appeared to have transmitted from multiple vessels simultaneously.

Two distinct periods of spoofing were detected for MMSI 150402944. On 18th July 2022 (figure 16), a small number of transmissions were received from locations approximately 9nm from the bulk of transmissions on this MMSI, at a speed and heading consistent with two vessels transiting to a meeting point. Vessel A - the vessel from which the bulk of transmissions originated - then engaged in a low-speed operation over the course of approximately four hours - representing a potential encounter, although no partner vessel was detected on AIS. Vessel B also showed slow speed tracks in a similar but distinct location during this period indicating it too may have undertaken a potential encounter with a vessel not active on AIS. Both vessels then appear to have commenced transiting back towards the main fishing grounds, with only a few more transmissions detected that were clearly from a second vessel (vessel B) before it appears to cease transmitting. The pattern of detected static transmissions indicates that vessel A was transmitting as FU YUAN YU 9993 (over a type A device), and vessel B was transmitting on a type B device as FU YUAN YU 717 (a name not known from any official sources). It appears that vessel B may have briefly switched on AIS, possibly for the purpose of an encounter with a vessel that was not transmitting on AIS (potentially a reefer or bunker vessel).

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<sup>41</sup> Spoofing in this context refers to AIS transmissions occurring simultaneously on two vessels in different locations with the same MMSI. This was examined using a machine learning model that breaks AIS transmissions into related segments of track which are similar in space and time. These track segments were then checked for overlap in time with other segments from the same MMSI which was an indicator of likely spoofing.



**Figure 16** - AIS track of 150402944 on 18th July 2022, showing transmissions from vessel A (red) and vessel B (blue)

The name transmitted over MMSI 150402944 changed from FU YUAN YU 9993 to LU RONG YUAN YU 277 on 27th July 2022, as the primary vessel transmitting on this MMSI commenced its transit from the Atlantic to the Pacific fishing grounds. From 19th July to 27th December, no static messages were received from a type B device, consistent with the period when the MMSI was transmitting from the Pacific Ocean. After the primary vessel transmitting this MMSI returned to the Atlantic, a period of intermittent type A and type B transmissions resumed from 28th December, and the name transmitted changed from LU RONG YUAN YU 277 back to FU YUAN YU 9993. Whilst both type A and type B messages transmitted the name FU YUAN YU 9993, there was a small difference in formatting (with a comma included in the name in type B messages). There were also indications of transmission from two separate vessels seen in positional data, starting on 28 December, with the majority of transmissions appearing to originate from a single vessel in transit, and a small number of transmissions from locations approximately 4nm to the north of this vessel, within 3-4 mins of the previous/subsequent transmission 4 miles away. This pattern becomes harder to detect once the vessels commence fishing, but several periods can be clearly identified where the MMSI is transmitted within the space of a few minutes from two locations several miles apart (Figure 17). There were two changes to the name transmitted over a type B device - on 30 January 2023 the name changed from FU YUAN YU 9993 to LU RONG YUAN YU 601, and on 4 February 2023 the name changed again to LU WEN YUANG YU 601.



**Figure 17 - AIS transmissions on MMSI 150402944 differentiated by AIS message type between 1st and 8th February 2023. Name changes occurring on AIS during this period are shown with black dots.**

The period of intermittent A and B transmissions lasted until 8 February 2023 when type A transmissions ceased. This is followed by a gap of several days with transmissions resuming on 13 February 2023, with the vessel name changed back to LU RONG YUAN YU 277, and all transmissions over a type B device from this point forward. This coincides with the vessel making two journeys of approximately 100nm from the main fishing ground, possibly for the purpose of transshipment with a reefer, which could explain the resumed use of the known vessel name. No vessel encounters were detected during this period, but three reefers and one bunker vessel were detected operating in the same areas on the same dates, so it is plausible that there were others present that were not transmitting on AIS. Interestingly, in this case the vessel returned to the fishing ground and continued to fish in the South Atlantic whilst transmitting the LU RONG YUAN YU name, which was not otherwise seen. Throughout this period, the vessels were operating in close enough proximity that it is not immediately obvious to someone viewing the vessel tracks that the MMSI was used by multiple vessels. This combined with the transmission of the same name by both vessels for the majority of the period suggests that the vessels may have used this MMSI to make two vessels appear as one to anyone monitoring over AIS, and thus conceal the total number (and identity) of vessels in operation on the fishing ground. The fact that the vessels only appear to have shared this MMSI whilst operating in the same area also points to this being deliberate and coordinated and makes it challenging to detect. Figure 18 provides a chronology of the type A and B transmissions of this MMSI, the names used, and the locations from which transmissions originated.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	
Type A	FU YUAN YU 9993						LU RONG YUAN YU 277						FU YUAN YU 9993					
Type B	FU YUAN YU 9993						FYY717							FYY9993	LRY601 / LWY601	LU RONG YUAN YU 277		
Location	ATLANTIC						PACIFIC						ATLANTIC					

**Figure 18** - Chronology of type A and type B transmissions of MMSI 150402944, Jan 2022 - May 2023 (periods of name transmission rounded to the nearest month start/end). This MMSI was associated with a single vessel name and only type A transmissions in the Pacific and was associated with five vessel names and type A and type B units in the Atlantic.<sup>42</sup>

Whilst no other instances of spoofing on a 150 fleet MMSI were detected using the machine learning approach outlined above, it is not certain that these were the only instances where this occurred. At least one instance of clear spoofing behaviour involving 150402944 (that occurred in December 2022) was visible to the naked eye, but not detected by the machine learning approach. This likely stems from discrepancies between AIS datasets from different satellite providers, as not all were available for the machine learning analysis<sup>43</sup>. It should also be noted that the period of simultaneous transmission over both a type A and type B device (e.g., transmissions from different device types within the space of less than an hour) extended well beyond the instances of spoofing detectable either through machine learning or the naked eye. This either indicates that during these periods, either (a) transmissions originated from a single vessel using both a type A and type B device or (b) type B transmissions originate from a different vessel throughout, but the vessels remain in very close proximity the majority of the time, making spoofing challenging or impossible to detect based on positional analysis. During the spoofing periods that were detected, there was no variation in the static identifiers transmitted over a type B device, which would seem to preclude option a, which would require two different vessels transmitting over type B devices during periods when spoofing is detected - but this is not the case if the MMSI is tied to only one type B device that is physically transferred between vessels. It is also noticeable that during some of the spoofing (Dec - Jan 23) both vessels transmitted (variants of) the same name, but in July 2022 and Feb 2023, the MMSI was transmitted with different names from different vessels.

Based on these findings, there are not clear indications that the type of close quarters spoofing behaviour described above is a common operational practice in this fleet. However, as with the findings around MMSI transfer between vessels, there are limitations to the analysis that mean that instances of this behaviour may not always be detected. Therefore, the overall prevalence of this behaviour is not known.

### Spoofing on associated 412 MMSIs

The 12 associated 412 MMSIs linked to this fleet were also analysed to check for instances of spoofing. Evidence of spoofing was found for seven of these MMSIs (412331279, 412331283, 412331284, 412331285, 412334074, 412420574, 412420659). The majority of these spoofing periods seemed to relate to transmissions containing positional errors (e.g., lat: 91, long: 181), however four MMSIs did have periods of genuine spoofing. In two of these cases, the MMSI was transmitted simultaneously by a vessel in the Pacific or Atlantic fishing grounds, as well as another vessel that was enroute to, or within, the Indian Ocean squid fishing ground. One case related to transmissions from a port in China whilst the MMSI was simultaneously transmitting from the Atlantic squid grounds. The final case (412334074)

<sup>42</sup> FYY - FU YUAN YU, LRY = LU RONG YUAN YU, LWY = LU WEN YUANG YU.

<sup>43</sup> This analysis was conducted on data provided by Orbcomm and Spire. Manual analysis also incorporated data from exactEarth. Small differences were found between datasets throughout this study, likely stemming from variations in satellite coverage meaning that some transmissions were not received by all providers.

involved transmissions that appear to originate from two vessels simultaneously active on the South Atlantic squid grounds from April to June 2022 - after which one vessel heads for the port of Montevideo, Uruguay, while the other transits into the Pacific fishing grounds. This case shows similarities to the spoofing of 150402944 in that it involves two vessels operating in relatively close proximity for part (though not all) of the spoofing period, and it may also be significant that 412334074 is the official MMSI associated with LU RONG YUAN YU 601, one of the names transmitted over 150402944 during its period of spoofing in February 2023 (unfortunately there were insufficient transmissions from 412334074 during February 2023 to determine whether it was originating from either of the vessels involved).

### **Indications of vessel identity sharing**

Periods of operations in the SPRFMO area by vessels transmitting over MMSIs in the 150 series were examined and compared to transmissions of the official MMSI's for the same period for the identities transmitted. The purpose of this analysis was to identify indications that multiple vessels were operating simultaneously in different locations using the identity that was transmitted over MMSIs in the 150 series in the SPRFMO area. Ten discrete periods of SPRFMO operations were identified (ranging in duration from a few days to close to a year). During seven of these periods, the name transmitted over the 150 series MMSI was a match for a known, SPRFMO authorised Chinese vessel name for at least a portion of the operations (in some cases the transmitted name changed mid-operation, sometimes multiple times). The location and identity of transmissions over the official 412 series MMSIs associated with those names was checked during the corresponding periods. In three cases, an authorised vessel identity being transmitted over MMSIs in the 150 series from a vessel operating in the SPRFMO area was simultaneously transmitted over the official MMSI from a vessel transiting eastwards or westwards between China and the Indian Ocean. In two further cases, a vessel operating in the SPRFMO area transmitted over an MMSI in the 150 series an authorised vessel name at the outset of those operations but changed to an unknown vessel identity for the majority of the time it was active in the SPRFMO area. In these cases, there were again indications of a second vessel, which was not the one present in the SPRFMO area, using that authorised identity on the official MMSI between China and the Indian Ocean. The detail of these instances of suspected identity sharing is outlined in table 1 below.

150 series MMSI	Operations within SPRFMO (likely fishing activity)	Identity transmitted	Official MMSI	Whereabouts of official MMSI during period of 150 transmissions from SPRFMO area	Identifiers transmitted over official MMSI
150402944	25 Jun to 14 Dec 2020	LURONGYUANYU 277	412331282	From 26 May to 13 June, this MMSI, transmitting the name LURONGYUANYU277 was transiting back towards China from the Indian Ocean squid grounds. No other positional transmissions from this MMSI during 2020.	LURONGYUANYU 277
150402944	16 Aug to 9 Dec 2022	LURONGYUANYU 277, BCLN2	412331282	Transmitted 12-13 Oct from the vicinity of Nanmen Bay, near Dongshan, China; 20-21 Oct it transmitted whilst transiting westwards through the Malacca Strait. No other transmissions from this MMSI during 2022.	LURONGYUANYU 277, BCLN2
150400453	16 Aug to 9 Dec 2022	LURONGYUANYU 715	412331284	Through this period, it appears as if 412331284 is being transmitted from onboard the same vessel as 150400453; however, from 11/10/22 to 29/10/22, 412331284 was simultaneously being transmitted (intermittently) from a vessel that was transiting from Chinese coastal waters, through the Malacca Strait and into the Indian Ocean. All static identifier messages include the name LURONGYUANYU715, but during that period in October, some messages include consistently different length, breadth, callsign and device type compared to the majority of messages - indicating that the LURONGYUANYU715 transmissions were coming from different AIS transponders/vessels.	LURONGYUANYU 715
150402949	14 May 2019 to 3 Apr 2020	LURONGYUANYU 197 (to 26/05/19), SHUNHANG67 (from 26/05/19)	412331281 (LURONGYUANYU197)	On 30/10/19 there was a single transmission on MMSI 412331281 from Shidao Bay, China; and several transmissions were then received 16 to 18 November 2019 from (presumably) the same vessel transiting westwards through the Singapore Strait. No other transmissions were received over this MMSI during this period.	LURONGYUANYU 197
150402940	14 May 2019 to 3 Apr 2020	LURONGYUANYU 195 (to 26/05/19), SHUNHANG66 (from 27/05/19)	412331279 (LURONGYUANYU195)	From 16/11/19 - 18/11/19, the official MMSI associated with LURONGYUANYU195 was transmitting the name LURONGYUANYU195 from the Singapore Strait	LURONGYUANYU 195

**Table 1** - Instances where a SPRFMO authorised vessel identity was transmitted for part or all of a period of operations in the SPRFMO area, and the same identity was simultaneously transmitted from a different part of the globe over the official MMSI associated with that vessel name.



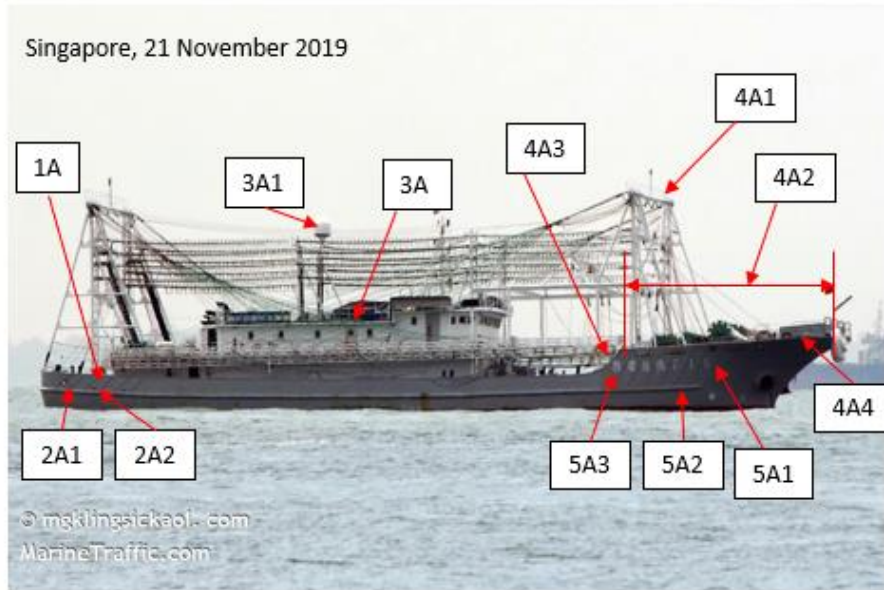
In addition to the AIS analysis outlined above that identified several cases where two vessels were simultaneously operating under the same identity on both a 150 series MMSI along with the official MMSI, photos are also available that indicate what appear likely to be two different vessels assuming the same 150 MMSI-associated identity.

Publicly available photos of the LU RONG YUAN YU 715, taken by shipspotters and shared online, were analysed for periods relevant to the transmission of that name over a 150 MMSI in the SPRFMO area. Two photos were identified showing what appears likely to be the same vessel - photographed in Punta Arenas, Chile in June and December 2020. On the date that the December photograph was taken, a vessel transmitting the name LURONGYUANYU715 over MMSI 150400453 was in Punta Arenas, indicating that the photo likely shows that vessel. During June 2020 there were no transmissions on 150400453 or the official MMSI associated with LU RONG YUAN YU 715, but it is plausible that this photo shows the same vessel entering the Pacific at the start of its operations. Another photo, taken in Singapore in November 2019 shows a squid vessel of similar build but configured to operate with 'tiger nets'. This vessel also has a number of other observable differences, including the number and distribution of rubbing strakes, the length of the spray rail, the number of portholes/doors visible on the superstructure, the shape of the bulwark at the stern and bow of the vessel, and the placement of the satellite antenna. In addition, analysis of the photos indicates that the vessels have slightly different dimensions with the raised forward deck at the bow appearing to represent a larger percentage of the overall vessel length in the vessel photographed in Singapore ( $\approx 28\%$  of overall vessel length), compared to the other two ( $\approx 20\%$  of overall vessel length) photographed in Punta Arenas.

There were no transmissions over the official MMSI associated with LU RONG YUAN YU 715 during 2019 or 2020, and during November 2019 150400453 was operating in the SPRFMO area but transmitting a different (unknown) name - so it is not possible to corroborate these photos with AIS reporting. However, the fact that two vessels were using the LU RONG YUAN YU 715 identity in 2022 (see table 1), combined with the clear physical differences and the significant investment that the gear seen on the vessel in 2019 represents, indicates that these photos do very likely show different vessels. Figure 19 below shows the photos and identification of areas of interest. The top right and bottom photos both taken in Punta Arenas show strong similarities while the top left photo, taken in Singapore, shows clear differences<sup>44</sup>.

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<sup>44</sup> Links to the original photos online are provided to support access to higher resolution images.



Punta Arenas, 27 Dec 2020

**Figure 19** - Photos of LU RONG YUAN YU 715 taken in Singapore, 21 November 2019

([https://www.marinetraffic.com/en/photos/of/ships/shipid:5304898/shipname:LURONGYUANYU715?order=date\\_uploaded](https://www.marinetraffic.com/en/photos/of/ships/shipid:5304898/shipname:LURONGYUANYU715?order=date_uploaded)), Punta Arenas, 9 June 2020 ([https://www.marinetraffic.com/en/photos/of/ships/shipid:5304898/shipname:LURONGYUANYU715?order=date\\_uploaded](https://www.marinetraffic.com/en/photos/of/ships/shipid:5304898/shipname:LURONGYUANYU715?order=date_uploaded)) and Punta Arenas, 27 December 2020 ([https://www.marinetraffic.com/en/photos/of/ships/shipid:5324128/shipname:LURONGYUANYU%20715?order=date\\_uploaded](https://www.marinetraffic.com/en/photos/of/ships/shipid:5324128/shipname:LURONGYUANYU%20715?order=date_uploaded)). Clear differences between the vessel in the photo from Singapore and the vessel photographed in Punta Arenas, are discussed in table 2 below.

Vessel Part/Area	Noted Differences
1. Stern Area - Above Deck	The stern bulwark (stern rail) on the vessel in the image taken in Singapore (1A) is on the same relative contour as the bulwark (rail) amidship. The two images taken in Punta Arenas (1B and 1C) show the stern bulwark (stern rail) raising/stepping up slightly from the contour of the bulwark (rail) amidship aft of the superstructure.
2. Hull - Vessel Stern	The image taken in Singapore shows 6 rubbing strakes (2A1) and 2 drainage scuppers (2A2) visible on the hull towards the stern. The two Punta Arenas images (2B1, 2B2 and 2C1, 2C2) show 9 rubbing strakes and 3 drainage scuppers visible on the hull towards the stern.
3. Superstructure	In the Singapore image the starboard side top level of the superstructure aft of the wheelhouse door appears to have one door (3A) and five windows. The two Punta Arenas images (3B and 3C) appear to show only five windows with no door in the corresponding location. The Singapore image (3A1) also shows a satellite antenna extending up from the superstructure that is not visible in either of the Punta Arenas photos.
4. Bow Area - Above Deck	The Singapore image shows significant additional equipment / rigging with the vessel appearing to be outfitted to fish with tiger nets. This includes large supporting structures to take the booms that extend out from the side of the vessel and from which the nets are deployed. One of these supporting structures (4A1) is on or near the forward deck near the bow of the vessel, whereas the two images from Punta Arenas show only a single crane/boom (4B1 and 4C1) on or near the forward deck near the bow of the vessel. The images also show a difference in the length of the raised forward deck on the vessels photographed in Singapore and in Punta Arenas. The bulwark curves and raises up as it reaches the forward deck and this raised section accounts for approximately 28% of the overall vessel length in the Singapore image (4A2), while only appearing to account for approximately 20% in the two images from Punta Arenas (4B2 and 4C2). The angle at which this section of the bulwark curves up is also greater in the Singapore image (4A2) than in the two Punta Arenas images (4B3 and 4C3) and there are also different rail configurations around the bow of the vessel photographed in the Singapore (4A4) image and that shown on the vessel photographed in the two images

	from Punta Arenas (4B4 and 4C4).
5. Hull - Vessel Bow	<p>The image taken in Singapore appears to show nine rubbing strakes visible on the hull near the bow of the vessel (5A1) with these starting forward of where the bulwark curves and raises up to meet the raised forward deck. The spray rail on the vessel in this image also extends forward below six of these rubbing strakes with the end of the spray rail meeting the bottom of the seventh (5A2) rubbing strakes when counting from amidship forward (approximately halfway along the raised forward deck). In the vessels shown in the two images taken in Punta Arenas, 7 rubbing strakes appear visible (5B1 and 5C1) on the hull near the bow of the vessel and the first of the most aft of these forward rubbing strakes meets the top of the bulwark approximately halfway up the curve to the raised forward deck. The spray rail also only extends below four of these forward rubbing strakes with the end of the spray rail meeting the fifth (5B2 and 5C2) rubbing strake when counting from the aft of the forward rubbing strakes and only extends a short distance under the raised forward deck. There are also differences in the way the name is displayed on the starboard side of the bow, with the name in the image taken in Singapore showing consistent size and symmetry between characters (5A3). This is not the same in the Punta Arenas images with the name appearing hand painted and inconsistent in size and form (5B3 and 5C3).</p>

**Table 2** - Analysis of vessel images highlighting the differences between the vessel photographed in Singapore in 2019 and the vessel shown in the two images from Punta Arenas in 2020.

## Possible drivers for this behaviour

The motivation for the different behaviours outlined in this analysis is not entirely clear, however there are elements of the regulatory landscape in which these vessels are operating that may explain at least some of the behaviours that have been observed.

### Squid fisheries in the Atlantic versus Eastern Pacific

The suspected change in gear type that has been identified when vessels move between the Pacific and Atlantic squid fisheries will, at least in part, relate to the different levels of regulation and control between the two fisheries within which these vessels are operating - the Jumbo Squid fishery in the Eastern Pacific and Argentine Shortfin Squid fishery in the South Atlantic. There is currently no RFMO with jurisdiction over the Atlantic fishing grounds<sup>45</sup>. Whilst management occurs within EEZs in the South Atlantic, the Argentine Shortfin Squid stock straddles both the EEZs and the high seas areas where these vessels are active.

In the Eastern Pacific, the Squid fisheries are managed through SPRFMO. All of the RFMO-authorized vessel identities associated with this fleet are listed as handliners (squid jiggers) in the authorized vessel list of SPRFMO. Within SPRFMO, midwater trawling has been included in the definition of bottom-fishing and this has applied throughout the study period (CMM 03-2019 and superseding measures). Except in the case of exploratory fisheries, bottom fishing has been restricted to discrete locations in the South Pacific closer to Australia and New Zealand (east of 146°W). Consequently, midwater trawling for squid, as observed in the Atlantic squid grounds, is unlikely to be permitted within the SPRFMO squid grounds where these MMSIs have been active. This increased level of regulation in the Eastern Pacific compared to the south Atlantic would make the use of alternative gear and unauthorized identifiers by these vessels a lot more challenging and higher risk.

In addition, research<sup>46</sup> indicates that Argentine Shortfin Squid mainly concentrate from 50-200 metres depth on the continental shelf. The fishing grounds, and consequently fishing effort, in the South Atlantic are concentrated in a relatively small area which may make them more suitable for trawl fishing gear, whereas Jumbo Flying Squid in the Eastern Pacific tend to prefer slightly deeper water, are more dispersed and can migrate long distances, which likely makes them more suitable for squid jigging operations. In addition, both squid species tend to concentrate close to the seabed during the day and move to the surface at night for feeding. It is unclear if the use of trawl gear in the South Atlantic would enable increased effort during daylight hours compared to jigging. The use of trawl gear would also enable the targeting of a greater range of species than jigging would. But without seeing the gear, catch and records onboard the vessels, whether these, or some other driver, has motivated the suspected change of gear between fisheries is unclear.

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<sup>45</sup> There was previously a bilateral RFMO, the South Atlantic Fisheries Commission, but this disbanded in 2005.

<sup>46</sup> Refer to [SWAT \(seafoodwatch.org\)](http://SWAT.seafoodwatch.org)



## China's regulatory framework

In 2017, China undertook to cap its distant-water fleet at 3,000 vessels by the year 2020<sup>47</sup>. Then a reported 2021 policy document<sup>48</sup> set out a trial plan to limit the number of squid vessels in high seas squid fisheries between 1 April 2022 and 31 March 2023. This set vessel limits for the southeast Pacific of no more than 400 vessels, and for the southwest Atlantic of no more than 300 vessels. Each squid vessel was also not permitted to operate in more than two of the five defined high seas squid fishing areas during this year.

These vessel limits would certainly provide an incentive for some vessels to undertake behaviour that may make monitoring more difficult. But a lot of the identified behaviour pre-dates the establishment of these limits, and in 2020 China reported<sup>49</sup> increased vessel reporting requirements for the distant water fleet. If implemented effectively, these vessel reporting requirements would presumably make the AIS behaviour less effective at masking vessel numbers and activities to Chinese authorities.

During 2020, the Chinese Ministry of Agriculture and Rural Affairs, the Ministry responsible for the regulation and control of China's distant water fishing fleet, reported that it was introducing new Management Measures for the High Seas Squid Fisheries<sup>50</sup>. These measures included a trial of a closed season from 1 July to 30 September on the high seas of the southwest Atlantic Ocean, and from 1 September to 30 November on the high seas of the eastern Pacific Ocean. All Chinese DWF Squid vessels were required to suspend fishing operations in these defined areas during the closed seasons. The Ministry then reported that these were to become formal closed squid fishing seasons to be conducted each year from 2021.

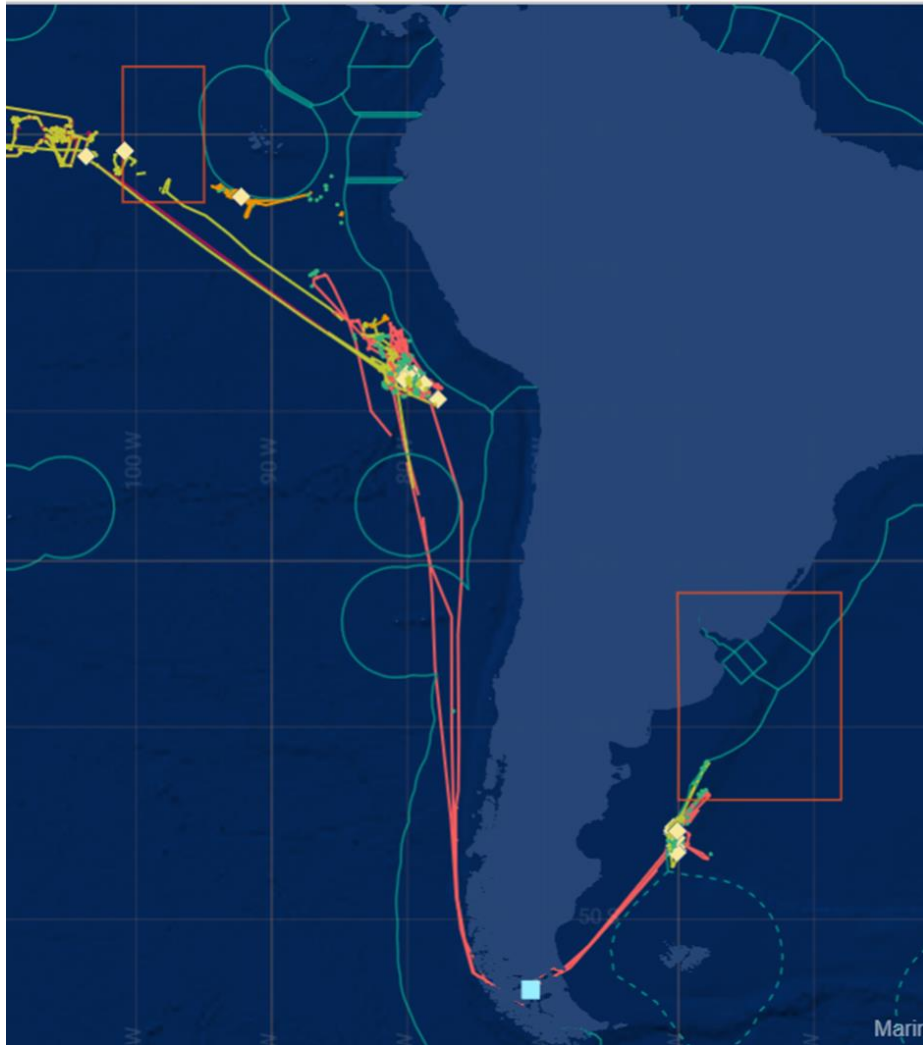
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<sup>47</sup> [http://m.xinhuanet.com/2017-12/19/c\\_1122134835.htm](http://m.xinhuanet.com/2017-12/19/c_1122134835.htm)

<sup>48</sup> Refer to China starts limiting squid boat numbers (chinadialogueocean.net)

<sup>49</sup> [http://www.gov.cn/gongbao/content/2019/content\\_5456825.htm](http://www.gov.cn/gongbao/content/2019/content_5456825.htm)

<sup>50</sup> [http://www.moa.gov.cn/nybg/b/2020/202007/202008/t20200811\\_6350178.htm](http://www.moa.gov.cn/nybg/b/2020/202007/202008/t20200811_6350178.htm)



**Figure 20** - the AIS tracks of the main MMSIs in the 150 fleet through the research period and the closed areas implemented by China on their distant water squid vessels (red boxes).

But these also don't appear to be strong incentives for all of the vessel behaviour we have identified. Figure 20 shows the reported location of the closed areas (red boxes), and the AIS tracks of the main MMSIs in the 150 fleet through the research period. The vast concentration of effort in the South Atlantic occurs south of the closed area and, in addition to this, the closed season in the South Atlantic commences in July, after most vessels have already left this fishery. As noted earlier in the report, these vessels typically operate in the South Atlantic between the months of December and May.

Some of the restrictions imposed by China on their flagged distant water squid vessels, such as vessel limits, will have no doubt created an incentive for vessels to behave in the manner we have witnessed within the 150 fleet. However, many of the more specific controls have been applied in the period after the majority of this behaviour has occurred, and some measures will have had limited impact on the bulk of the squid vessels due to the timing and location that these controls are applied.

Despite the identification of regulatory and fishery factors that could go some way to explain some of the behaviours outlined in this report, the full motivation is unclear. Nevertheless, it is clear that the AIS



behaviours demonstrated by this fleet make it extremely hard to accurately assess vessel numbers, determine true vessel identities and track vessels over time, presenting a significant challenge for monitoring and control of this fleet.

## Recommendations

Any distant-water squid vessel that is currently or has in the past transmitted over an MMSI in the 150 series, or has transmitted one of the vessel identities listed in the Annex below, should be considered high risk, on the basis of engaging in or links to an operating pattern that serves to obfuscate vessel identity.

On that basis, it is strongly recommended that such vessels are inspected should they seek to enter port, with a particular focus on confirming their identity, including through verification of vessel documents and confirmation of the AIS transponders onboard.

We encourage any partners that inspect such vessels to share with the Joint Analytical Cell any information gained or results of their inspection so that our assessment may be updated. Assistance with the analysis of any findings from an inspection can also be provided.

## Annex

**Table 3** - The normalised<sup>51</sup> vessel names transmitted by the 150 fleet and the MMSIs associated with each name.

Vessel Name	IMO	Owner	MMSI/s
FUYUANYU0309			150402940
FUYUANYU303			150400453
FUYUANYU715			150400453, 150400465, 150400460, 150400480, 150400467, 150400477
FUYUANYU717			150402944, 150402947
FUYUANYU9993	8567743	Fujian Hengli Fishery Co Ltd	150402944, 150402940, 150402995, 150402960
FUYUANYU9994			150402951
FUYUANYU9995	8567755	Fujian Hengli Fishery Co Ltd	150400453
HAIHANG1			150402944, 150402989, 150402945, 150403002
HAIHANG2			150402951
HAIHANG3			150400453, 150400469
HAIHANG5			150402940
HAIHANG6			150402949, 150403000
LUQINGYUANYU271			150402940
LUQINGYUANYU290			150402949

<sup>51</sup> Normalising vessel names meant consolidating all vessel names transmitted on AIS with similar nomenclature thought, based on extensive analysis, to represent the same vessel together i.e., ignoring minor differences in spelling or spacing that are likely a consequence of errors occurring when entering data in the AIS unit. In Annex Table 3 all names are presented without spaces e.g., value 'LURONGYUANYU715' represents 'LU RONG YUAN YU 715', 'LURONGYUANYU 715' and 'LURONGYUANYU715' as well as any slight variation in spelling or spacing with the same 715 suffix.

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Vessel Name	IMO	Owner	MMSI/s
LURONGYUANYU195	8786545	Shidao Group, Rongcheng Huadong Fishery Co Ltd	150402944, 150400453, 150402947, 150400459, 150400508
LURONGYUANYU197	8786557	Shidao Group, Rongcheng Huadong Fishery Co Ltd	150402949, 150402947, 150402940, 150403000
LURONGYUANYU20	8749705	Shandong Lidao Oceanic Technology Co Ltd	150402944, 150402951
LURONGYUANYU277	8786569	Shidao Group, Rongcheng Huadong Fishery Co Ltd	150402944, 150402947, 150403006, 150402988, 150403003, 150403005, 150402952, 150402974, 150402998, 150403001, 150403007
LURONGYUANYU278	8786571	Shidao Group, Rongcheng Huadong Fishery Co Ltd	150402951, 150403003
LURONGYUANYU581	9871971	Shidao Group, Rongcheng Huadong Fishery Co Ltd	150400453, 150402947
LURONGYUANYU601	9847499	Rongcheng Homey Ocean Fishing Co Ltd, Rongcheng Haodangjia Ocean Fishery Co Ltd	150402944
LURONGYUANYU715	8786583	Shidao Group, Rongcheng Huadong Fishery Co Ltd	150400453, 150400463, 150400465, 150400483, 150400488, 150400502, 150400476, 150400499, 150400450, 150400471, 150402957, 150400467, 150400478
LURONGYUANYU717	8786595	Shidao Group, Rongcheng Huadong Fishery Co Ltd	150402947, 150402940, 150400483
LUWENYUANGYU601			150402944
SHUNHANG1			150402944, 150402978
SHUNHANG2			150402951
SHUNHANG3			150400453
SHUNHANG5			150402940

Vessel Name	IMO	Owner	MMSI/s
SHUNHANG6	8776588	Zhoushan Shunhang Ocean Fisheries Co Ltd	150402949
SHUNHANG66			150402940
SHUNHANG67			150402944, 150402949
SHUNHANG68 <sup>52</sup>	8776459	Zhoushan Shunhang Ocean Fisheries Co Ltd / Zhoushan Shunxing Blue Waters Fishery Co Ltd	150402947
SHUNHANG79			150400453
SHUNHANGYUANYU 879			150400453

**Table 4** - The MMSIs used by the 150 fleet that transmitted on more than one vessel name and the normalised vessel names they transmitted.

MMSI	Vessel Names	No. of transmissions 01/01/2020 - 31/12/2022
150402944	HAIHANG1, LURONGYUANYU277, FUYUANYU9993, SHUNHANG1, LURONGYUANYU20, LURONGYUANYU195, FUYUANYU717, SHUNHANG67, LURONGYUANYU601, LUWENYUANGYU601	840168
150400453	LURONGYUANYU195, FUYUANYU715, LURONGYUANYU715, SHUNHANG3, HAIHANG3, FUYUANYU9995, LURONGYUANYU581, SHUNHANG79, SHUNHANGYUANYU879, FUYUANYU303	133717
150402951	LURONGYUANYU20, LURONGYUANYU278, HAIHANG2, SHUNHANG2, FUYUANYU9994	45261
150402949	SHUNHANG67, HAIHANG6, IURONG6, LUQINGYUANYU290, SHUNHANG6, LURONGYUANYU197	35176

<sup>52</sup> This name was only transmitted in 2020, at which point sources indicate that IMO 8776459 was named JIA DE 12 - that vessel was renamed SHUN HANG 68 in December 2022

<b>MMSI</b>	<b>Vessel Names</b>	<b>No. of transmissions 01/01/2020 - 31/12/2022</b>
150402944	HAIHANG1, LURONGYUANYU277, FUYUANYU9993, SHUNHANG1, LURONGYUANYU20, LURONGYUANYU195, FUYUANYU717, SHUNHANG67, LURONGYUANYU601, LUWENYUANGYU601	840168
150402947	LURONGYUANYU277, LURONGYUANYU195, FUYUANYU717, LURONGYUANYU581, LURONGYUANYU197, LURONGYUANYU717, SHUNHANG68	34980
150402940	FUYUANYU9993, LURONGYUANYU197, LURONGYUANYU717, URONG5, HAIHANG5, SHUNHANG5, SHUNHANG66, LUQINGYUANYU271, FUYUANYU0309	23471
150403003	LURONGYUANYU277, LURONGYUANYU278	11
150400465	FUYUANYU715, LURONGYUANYU715	8
150400483	LURONGYUANYU715, LURONGYUANYU717	8
150403000	HAIHANG6, LURONGYUANYU197	7
150400467	FUYUANYU715, LURONGYUANYU715	4

**Table 5** - The MMSIs used by the 150 fleet that transmitted only a single name.

<b>MMSI</b>	<b>Vessel name</b>	<b>No. of transmissions 01/01/2020 - 31/12/2022</b>
150400450	LURONGYUANYU715	5
150400459	LURONGYUANYU195	5
150400460	FUYUANYU715	6
150400463	LURONGYUANYU715	8
150400469	HAIHANG3	4
150400471	LURONGYUANYU715	5
150400476	LURONGYUANYU715	6
150400477	FUYUANYU715	2
150400478	LURONGYUANYU715	4
150400480	FUYUANYU715	5
150400488	LURONGYUANYU715	8

150400499	LURONGYUANYU715	6
150400502	LURONGYUANYU715	7
150400508	LURONGYUANYU195	2
150402917	URONG5	6
150402945	HAIHANG1	8
150402952	LURONGYUANYU277	10
150402957	LURONGYUANYU715	5
150402960	FUYUANYU9993	9
150402974	LURONGYUANYU277	10
150402978	SHUNHANG1	9
150402988	LURONGYUANYU277	13
150402989	HAIHANG1	11
150402995	FUYUANYU9993	11
150402998	LURONGYUANYU277	9
150403001	LURONGYUANYU277	9
150403002	HAIHANG1	6
150403005	LURONGYUANYU277	11
150403006	LURONGYUANYU277	15
150403007	LURONGYUANYU277	6

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# JOINT ANALYTICAL CELL



C4ADS



## About the Joint Analytical Cell:

The Joint Analytical Cell, or JAC, provides authorities with fisheries intelligence, data analysis and capacity building to help combat illegal, unreported and unregulated fishing. Founded by the International Monitoring, Control and Surveillance Network, Global Fishing Watch and TMT, the initiative's members also include C4ADS and Skylight. By harnessing innovative technology and the complementary expertise of its collaborating organizations, the JAC fosters cooperation among State and non-State actors to build insights and capacity to help enhance fisheries management.

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