



Australian Government
Australian Transport Safety Bureau

Collision between *Royal Pescadores* and *Da Heng Shan*

Gage Roads Anchorage, Fremantle, Western Australia | 8 May 2014



Investigation

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Addendum

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Safety summary

What happened

At some time before 0530 on 8 May 2014, in adverse weather conditions at Fremantle anchorage, the securing pin worked free from *Royal Pescadores*' port anchor chain cable stopper bar. The bar then opened and the windlass brake took the cable load. The brake did not hold and the cable ran out to its bitter end.

At about 0535, the securing arrangement of the bitter end gave way and the entire anchor cable was lost into the sea. With the anchor no longer holding it, the ship turned beam on to the wind and drifted towards *Da Heng Shan* anchored nearby.

At 0548, *Royal Pescadores*' stern collided with the bow of the other ship. Shortly after 0550, *Royal Pescadores*' main engine was started and it was manoeuvred clear. Both ships suffered minor collision damage.

What the ATSB found

The ATSB found that the poor condition of *Royal Pescadores*' anchoring equipment was indicative of inadequate maintenance. As routine rounds to check the anchor cable had not been undertaken, no one detected the cable stopper's securing pin as it worked free. Further, the ship's main engine was not in an appropriate state of readiness for the adverse weather conditions forecast.

Although not contributing to the collision, *Royal Pescadores*' anchor cable bitter end securing arrangement was not in accordance with the recognised and recommended design that would allow it to be slipped from outside the chain locker.

The investigation also identified that Fremantle vessel traffic service's (VTS) precautionary measures for adverse weather conditions were triggered by Bureau of Meteorology (BoM) issued weather warnings. The VTS procedures contained no mechanism to trigger those measures in response to local wind speed conditions. As a result, there was a delay in implementing the measures in deteriorating weather conditions on 8 May.

What's been done as a result

Royal Pescadores' manager advised the ATSB that it has taken safety action to improve the implementation of its shipboard safety management system (SMS). The action includes measures to improve crew familiarisation with the SMS, greater company oversight of planned shipboard maintenance, and highlighting the incident to ships in its fleet through a safety circular.

The ship's managers also advised that all post-2013 built ships in its fleet are equipped with bitter end release arrangements in accordance with the recognised design recommendations. Further, the company intends to ensure this recommendation is applied to ships that it builds in the future.

Fremantle VTS has revised its weather-related procedures with the aim of ensuring that defined wind speed limits trigger precautionary measures. A range of new equipment and appropriate training for operators complements the revised procedures.

Safety message

Weather conditions associated with high wind speeds expose ships at anchor to the risk of dragging anchor and damage to anchoring equipment, and can result in grounding or collision. Therefore, it is imperative that the masters of ships take all necessary precautions to avoid such serious incidents. In waters covered by a vessel traffic service (VTS), the VTS can assist masters in managing those risks by providing weather and other relevant information.

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The occurrence

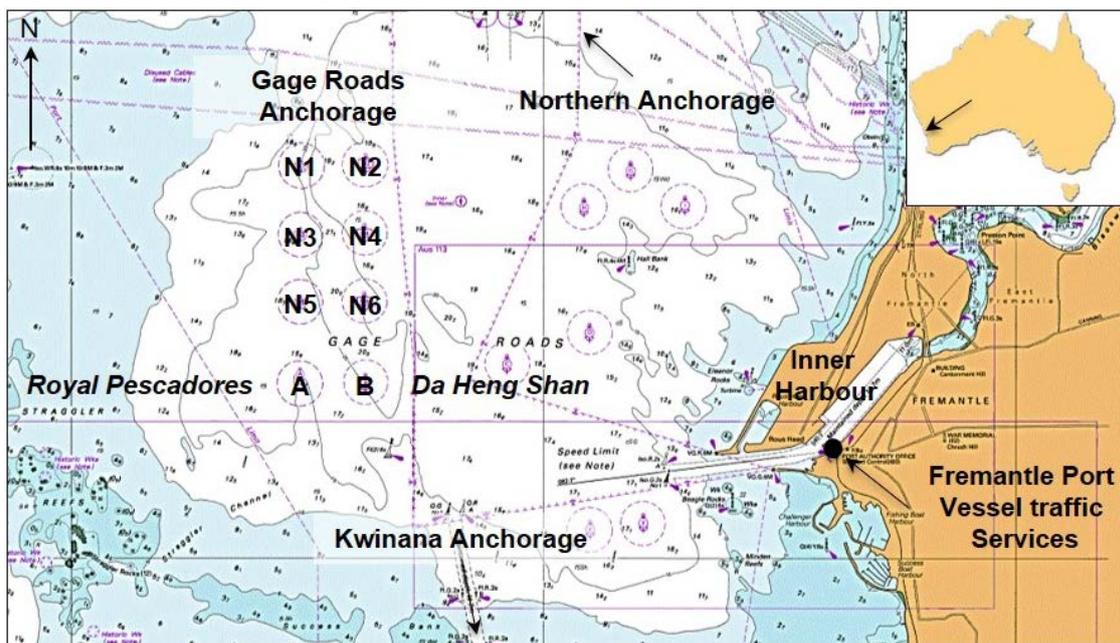
On 28 April 2014, the 148 m bulk carrier *Royal Pescadores* (cover) anchored at Kwinana anchorage, about 4 miles¹ from the Port of Fremantle. The ship's cargo holds were surveyed and it was found that making them fit for the carriage of grain needed descaling and cleaning operations. As shore assistance was required for this operation, the ship needed to berth in Fremantle, where shore cleaning equipment and workers would be used to prepare for another hold survey.

At 1755² on 30 April, the anchor was weighed and the ship proceeded to a berth in Fremantle inner harbour. By 1852, it was all fast and hold cleaning started the following day.

On 2 May, an Australian Maritime Safety Authority (AMSA) surveyor boarded *Royal Pescadores* and conducted a Port State Control inspection. The inspection identified multiple deficiencies, including maintenance, housekeeping and record-keeping issues and the ship was consequently detained under the International Safety Management (ISM) Code.³ All deficiencies had to be rectified and the ship re-inspected before it would be permitted to leave port limits.

At 1800 on 6 May, after completion of cleaning, the ship's cargo holds were re-surveyed and found fit for the next cargo. The ship was scheduled to shift to an anchorage until loading orders were received. It was allocated anchorage A in Gage Roads (Figure 1) by Fremantle vessel traffic services (VTS).

Figure 1: Section of navigational chart Aus 117 showing Gage Roads Anchorage



Source: Australian Hydrographic Service with ATSB annotations

At 2015, *Royal Pescadores* departed its berth. At 2112, the ship brought up⁴ to its port anchor with six shackles⁵ of anchor chain (cable) in the water. The bridge watchkeeping seamen were then stood down as the crew had worked long hours while cleaning the cargo holds.

¹ A nautical mile is 1,852 m.

² All times referred to in this report are local time, Coordinated Universal Time (UTC) + 8 hours.

³ The Code is mandatory under SOLAS, the International Convention for the Safety of Life at Sea, 1974, as amended.

⁴ When a ship is riding to its anchor cable and the anchor is holding.

⁵ One shackle equals 90 feet or 27.43 m.

At 0800 on 7 May, the 106 m asphalt/bitumen tanker *Da Heng Shan* (Figure 2) let go its starboard anchor in anchorage B, about 0.5 miles east of *Royal Pescadores*. The wind throughout the day was from the west-northwest at force⁶ 5 or 6 (17 to 27 knots)⁷ with gusts up to 33 knots.

Figure 2: *Da Heng Shan* at anchor



Source: ATSB

In the early hours of 8 May, a number of line squalls with wind gusts up to 44 knots, accompanied by rain, passed across the anchorage from west to east. At 0300, the duty VTS officer (VTSO) recorded stormy weather conditions with a west-northwest wind at 21 knots.

At 0335, *Bellatrix*, a ship anchored at N2 anchorage (Figure 1) started dragging its anchor. The VTSO contacted the ship and asked the officer of the watch (OOW) to weigh anchor and re-position the ship in its designated anchorage. Shortly after, the inbound pilotage (and pilot boarding) of another ship was cancelled due to the worsening weather.

At 0534, a squall with wind gusts up to 56 knots moved across the anchorage. The increased noise from the wind and rain woke *Royal Pescadores'* master in his cabin. He telephoned the OOW, the chief mate, who confirmed that the ship was maintaining position.

At 0535, *Da Heng Shan's* OOW, the chief mate, observed on radar that *Royal Pescadores* was moving towards his ship. His calls to *Royal Pescadores* on VHF radio channels 12 and 16 went unanswered. He next attempted to attract *Royal Pescadores'* OOWs attention by sounding his ship's whistle. The chief mate then phoned the master and sounded the ship's general alarm.

Royal Pescadores' chief mate had heard the VHF radio calls. He checked the ship's position and realised that it was moving eastwards. He phoned the master and reported that the ship was dragging its anchor and moving at 1.5 knots. The master immediately went to the bridge and, using the ship's public address system, ordered the crew to their mooring stations. He instructed the chief mate to go to the forecandle deck (forecandle).

At 0537, the VTSO unsuccessfully attempted to make radio contact with *Royal Pescadores* to relay *Da Heng Shan's* earlier radio warning calls.

When *Royal Pescadores'* chief mate arrived on the forecandle, he saw that the port anchor cable was missing and informed the master that it had been lost. The master instructed him to let go the starboard anchor.

Meanwhile, *Da Heng Shan's* master ordered his chief mate to proceed to the forecandle and veer⁸ more anchor cable.

⁶ The Beaufort scale of wind force, developed in 1805 by Admiral Sir Francis Beaufort, enables sailors to estimate wind speeds through visual observations of sea states.

⁷ One knot, or one nautical mile per hour equals 1.852 kilometres per hour.

⁸ To pay out anchor cable under power using the windlass.

At 0540, the VTSO contacted *Royal Pescadores* and asked the master to weigh anchor immediately and take action to avoid colliding with *Da Heng Shan*.

At 0541, *Royal Pescadores*' master advised the VTSO that he was taking avoiding action and would let go the ship's starboard anchor. At 0545, the anchor was let go.

At 0547, *Da Heng Shan*'s main engine was started as the chief mate continued to veer more cable. The master used the main engine in an attempt to manoeuvre the ship's bow to port, away from the closing *Royal Pescadores*. Shortly afterwards, with collision imminent, *Da Heng Shan*'s chief mate retreated from the forecastle.

At 0548, *Royal Pescadores*' starboard quarter collided with *Da Heng Shan*'s bow. Shortly after, the two ships again made contact in the same areas.

At 0550, *Royal Pescadores*' main engine was started and run at slow ahead. The master began to dredge⁹ the starboard anchor and move clear of *Da Heng Shan*. He reported to VTS that the ship's port anchor had been lost. A few minutes earlier, the VTSO had received weather warnings issued by the Bureau of Meteorology (BoM).

At about 0600, the VTSO called the duty harbour master and discussed the situation and preceding events with him. At 0608, the VTSO asked *Royal Pescadores*' master to weigh anchor and proceed north to the outer anchorage and await further instructions.

At 0619, *Royal Pescadores*' anchor was aweigh and it proceeded towards the outer anchorage.

Shortly after, *Da Heng Shan*'s master reported to VTS that the ship's bow and deck structure had been damaged. *Royal Pescadores*' master had reported minimal damage to the starboard quarter shell plating.

At 0645, the duty harbour master instructed the VTSO to notify standby tug crews in the inner and outer harbour to maintain a gale watch. The wind speed had consistently been about 30 knots with stormy weather, including squalls and rain.

At 0700, the inner harbour tug had been manned. The outer harbour tug was manned about 30 minutes later.

By 0900, *Royal Pescadores*' was anchored in the outer anchorage.

⁹ Term used to describe the towing of an anchor at a short stay.

Context

Royal Pescadores

At the time of the incident, *Royal Pescadores* was registered in Panama, classed with ClassNK and managed by Shih Wei Navigation, Taiwan. Including the master, the ship had a crew of 20 Chinese and Burmese nationals.

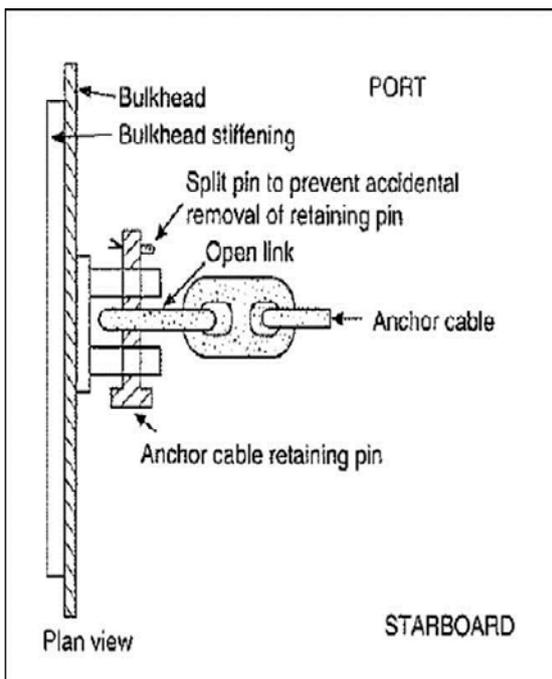
The master held a Chinese master's certificate of competency and had 21 years of seagoing experience, of which the last five had been in command of ships similar to *Royal Pescadores*. He had been on board *Royal Pescadores* for about 2 months.

The chief mate held a Burmese master's certificate of competency and had 10 years of seagoing experience, of which the last five had been on ships similar to *Royal Pescadores*. He had been on board the ship for about 4 months.

Anchoring equipment

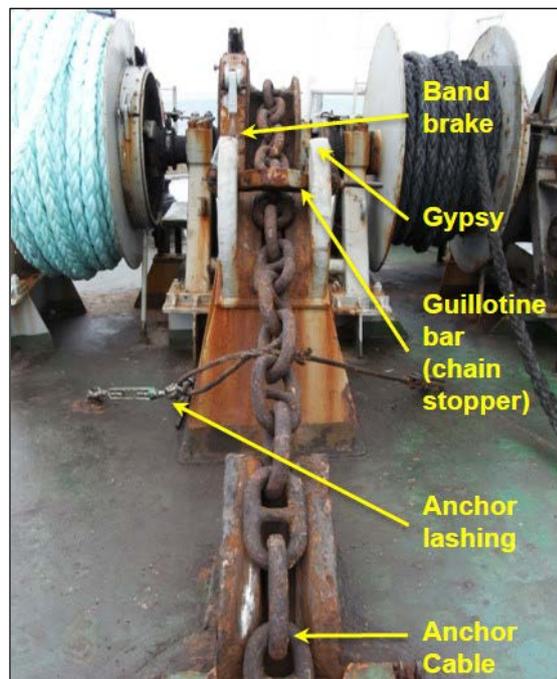
Royal Pescadores was equipped with two 4.89 tonne anchors, each fitted with 10 shackles of 54 mm diameter anchor chain cable (cable). Each anchor cable's bitter end¹⁰ was secured by a clench system inside the chain locker (Figure 3). Steel lugs were welded to the aft bulkhead in the locker and the open chain link at the end of the cable was attached to the lugs by a retaining pin.

Figure 3: Bitter end arrangement



Source: ATSB

Figure 4: Anchoring equipment on deck



Source: ATSB

Royal Pescadores' windlasses were fitted with a manual band brake system (Figure 4). Turning the brake handle tightened the band around the brake drum. When properly tightened, the brake lining should provide the necessary friction to prevent the drum and the gypsy¹¹ from turning.

A ship's windlass is not designed to take the load on the cable while it is at anchor. When the windlass is in gear (normally for veering or heaving in the cable) excessive load on the cable will

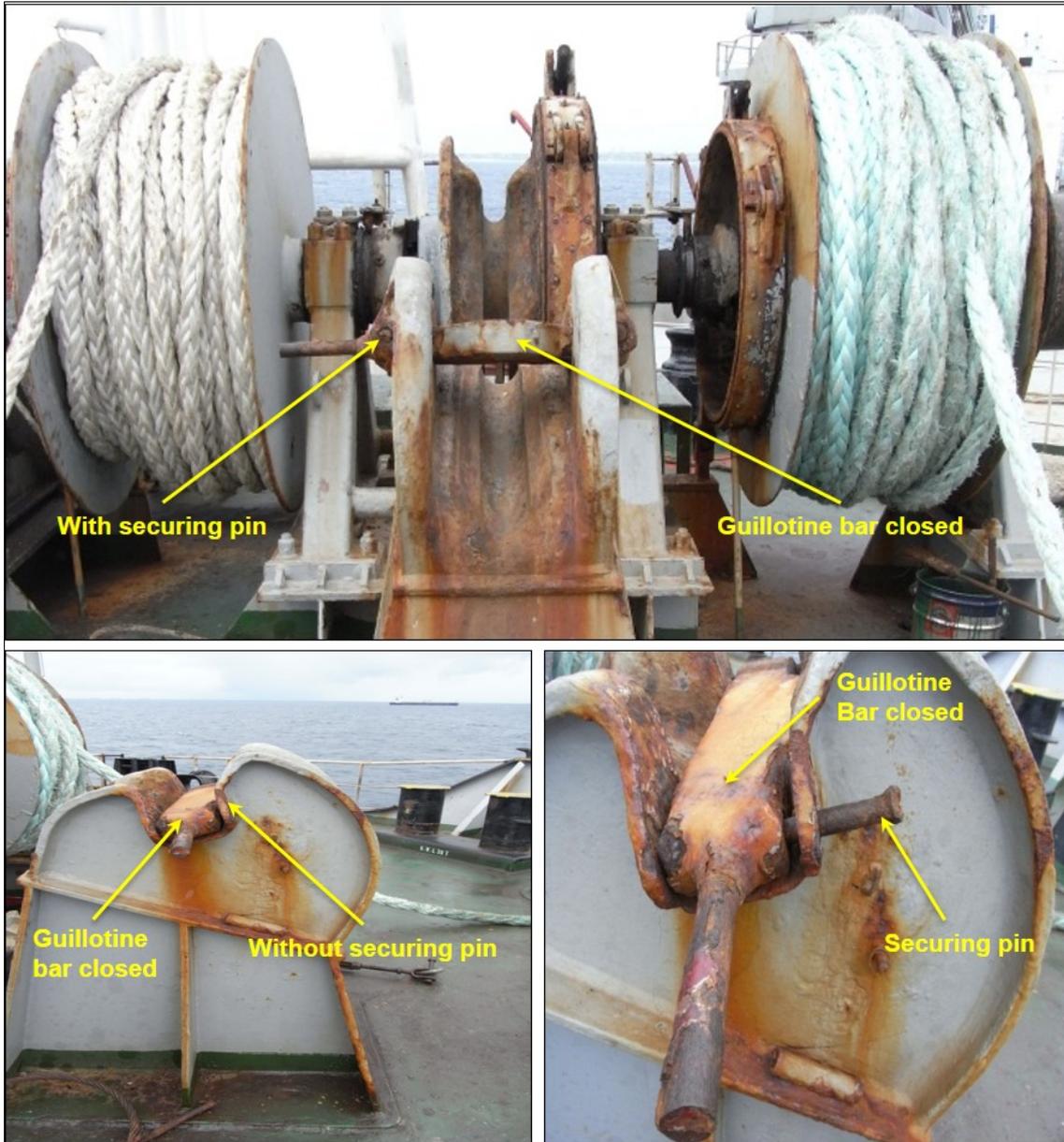
¹⁰ The inboard end of the anchor cable that is secured to a strong point normally with some form of quick-release arrangement to allow the cable to be safely slipped in the event of an emergency.

¹¹ A segmented vertical wheel on a windlass that is designed to hold the chain cable passing over it.

force the gypsy to turn faster than designed and result in damage to its motor. The windlass brake (with the gear disengaged) will hold the cable until it begins to slip at loads beyond its holding capacity. These potentially high loads on the anchor cable are intended to be taken by the cable stopper and transfer the load to the ship's structure, thus preventing damage to the windlass.

Royal Pescadores was fitted with hinged bar, guillotine-type cable stoppers, with a grooved track for the chain to pass through (Figure 5). Securing the cable required the guillotine bar to be fully lowered onto a horizontal chain link, with the next inboard vertical link bearing down on the bar. The bar was locked in this position by a securing pin.

Figure 5: *Royal Pescadores*' port windlass and chain cable stopper arrangement



Source: ATSB

Da Heng Shan

At the time of the incident, *Da Heng Shan* was registered in Hong Kong, classed with Bureau Veritas and managed by Tianjin Southwest Maritime, China. Including the master, the ship had a crew of 20 Chinese nationals.

The master held a Chinese master's certificate of competency and had 20 years of seagoing experience, of which the last three had been in command of ships similar to *Da Heng Shan*. He had been on board the ship for about 4 months.

The chief mate held a Chinese master's certificate of competency and had 12 years of sea going experience, of which the last seven had been on ships similar to *Da Heng Shan*. He had been on board the ship for about 4 months.

Port of Fremantle

Fremantle is the principal commercial port for Western Australia and is situated at the mouth of the Swan River. The port comprises the inner harbour, within the estuary of the Swan River, and an outer harbour with three open anchorages.

Fremantle Ports, the port authority, maintains a 24-hour vessel traffic service (VTS)¹² which aims to provide vessels using the port with an information service (INS)¹³ and a traffic organisation service (TOS)¹⁴ – in accordance with international guidelines. As part of its function, the VTS organises and manages traffic within its VTS area, and provides essential information related to ship movements.

The duty VTS officer (VTSO) is required to maintain a continuous watch, monitoring shipping traffic and provide information to ships, pilots, tugs and other users. The VTSO also provides information of ship movements, berth allocations and other matters related to the safety of navigation and weather within port waters.

Marine Weather Warnings

The Bureau of Meteorology (BoM) provides weather forecasts, warnings and observations for marine users in coastal and local water areas and high seas off Australia (see Appendix A). Weather warnings for coastal waters are issued on a defined schedule and updated whenever strong winds, gales, storm-force or hurricane-force winds¹⁵ are expected. The initial warnings aim to provide 24 hour lead times, and warnings are updated every 6 hours.

The warnings are broadcast via VHF radio channels 16 and 67 at 0718 and 1918 every day. The warnings are also transmitted at 0400 and 1600 daily as enhanced group calling (EGC) messages via the maritime satellite communication network. Normally these messages are automatically received and printed on board ships.

¹² A service implemented by a Competent Authority, designed to improve the safety and efficiency of vessel traffic and to protect the environment. The service should have the capability to interact with the traffic and to respond to traffic situations developing in the VTS area.

¹³ An information service is a service to ensure that essential information becomes available in time for on-board navigational decision-making.

¹⁴ A traffic organization service is a service to prevent the development of dangerous maritime traffic situations and to provide for the safe and efficient movement of vessel traffic within the VTS area.

¹⁵ The Bureau of Meteorology wind warning categories are based on the Beaufort scale of wind force, that is strong wind (26 to 33 knots), gale (34 to 47 knots), storm force (48 to 63 knots, hurricane force (64 knots or more).

Safety Analysis

The incident

At some time before 0530 on 8 May 2014, in adverse weather conditions, *Royal Pescadores*' port anchor cable stopper bar's securing pin worked free. The stopper bar opened and the windlass brake took the cable load. In the prevailing conditions, the brake did not hold and the cable ran out to its bitter end.

At about 0535, the bitter end securing arrangement gave way and the entire anchor cable was lost into the sea. With the anchor no longer holding it, the ship turned beam on to the wind and drifted towards *Da Heng Shan* anchored nearby.

At 0548, *Royal Pescadores*' stern collided with the bow of the other ship. Shortly after 0550, *Royal Pescadores*' main engine was started and it was manoeuvred clear. Both ships suffered minor damage as a result of the collision.

Loss of *Royal Pescadores*' anchor and cable

The loss of *Royal Pescadores*' port anchor and cable resulted from a combination of factors, including the adverse weather conditions and the failure of its anchoring equipment.

A visual inspection of the ship's anchoring equipment found that the port anchor cable stopper, including the guillotine bar and its securing pin and brackets, was corroded and worn. The securing pin and its guide holes were sufficiently corroded for the pin to be a loose fit. The pin itself was slightly bent and its thickness varied noticeably over its length. The securing chain attaching the pin to the stopper structure was missing.

The stopper's physical condition described above allowed sufficient movement of the bar for its securing pin to work free in certain conditions. The constantly changing load on the cable when riding to the anchor in adverse weather, and the resultant movement of the bar, provided a mechanism for the securing pin to move forward and out of its guide holes. The pin did not have any device (such as a split pin or a drop-nose pin) to prevent it from working free and falling out.

On 7 May, the boatswain (bosun) found that the guillotine bar's securing pin had almost worked free and he re-inserted it. After the anchor cable was lost the following day, the bosun found the securing pin on the deck near the stopper. It is evident that the pin fell out after working free in the manner described above, allowing the bar to lift and the load on the cable to come onto the windlass brake. The brake did not hold and the cable ran out to its bitter end.

The following conditions (Figure 6) indicated the overall poor condition of the windlass brake:

- band brake lining was hard, polished and thinned, with exposed securing rivet ends
- band brake backing plate was deformed
- brake drum surface was heavily scaled in places and pitted in others.

Figure 6: Port windlass band brake drum and lining after the incident



Source: ATSB

The deformed brake band meant that significantly less surface area of the lining could contact the drum when the brake was applied – reducing the brake holding capacity. The holding capacity was further reduced because of the hard polished lining, irregular drum surface and exposed rivet heads. These conditions are indicative of inadequate maintenance over a period of time, rather than being attributable to wear on the lining when the cable ran out on 8 May.

Royal Pescadores’ planned and other maintenance

The planned maintenance system (PMS) listed equipment that was to be checked at regular intervals. The anchoring equipment, including the windlass was to be checked every 3 months and a report sent to the ship’s managers, Shih Wei Navigation, detailing the:

- condition of brake linings
- condition of hydraulic systems
- date when all grease points were greased
- date when open gears and brake controller were greased.

The PMS also required that the windlass and its hydraulic pump be inspected and maintained during regular 5-yearly dry dockings.

At interview, *Royal Pescadores’* master and crew could not provide evidence or documents to indicate that the anchoring equipment had been checked, inspected or repaired in accordance with the PMS. The chief mate advised that the anchor cables had been ranged¹⁶ during the last dry dock in March 2014, but could not provide any supporting documentary evidence.

Subsequent investigation by the ATSB led to ClassNK, the ship’s classification society, providing relevant documents for the ship’s anchoring equipment. This information indicated that the port anchor and cable had also been lost previously (in December 2013) when the brake failed to hold during a routine anchoring. The anchor and cable were replaced in March 2014.

However, no documents related to the 2013 loss of the anchor and cable (or their replacement) were provided to ATSB investigators attending the ship after the collision. Furthermore, the ship’s management team including the master on board during the 2014 dry dock, did not provide or volunteer any information about the previous loss of the anchor or the anchoring equipment’s maintenance history.

When the ATSB contacted Shih Wei Navigation, the ship’s managers, to follow up the information provided by ClassNK, it provided some anchoring equipment maintenance and repair documents. These documents stated that the port windlass was opened for inspection in January 2012 and that the brake lining was replaced in July 2013. The records also indicated that the windlass brakes were inspected and tested in dry dock in March 2014. The ship’s 3-monthly maintenance reports since 2010 indicated that the crew had not identified any deficiencies with these systems.

In submission to the ATSB draft investigation report, Shih Wei Navigation acknowledged shortcomings in the implementation and completion of planned maintenance on board the ship. The ship’s managers attributed these shortcomings to a lack of familiarisation with the ship’s safety management system (SMS), its implementation on board, and the company’s oversight of planned maintenance.

Royal Pescadores’ anchor watch

Royal Pescadores’ SMS procedures for anchoring referenced the Bridge Procedures Guide.¹⁷ This publication is acknowledged as the principal industry guidance on the subject and is widely used internationally to support a shipboard SMS.

¹⁶ To lay out the cable on deck, or a wharf, or a dry dock.

¹⁷ International Chamber of Shipping (ICS), London, 2007, Bridge Procedures Guide, Fourth Edition 2007.

The ship's procedures required the OOW to use the anchor watch checklist provided in the Bridge Procedures Guide. Amongst other checks, the checklist stated that while at anchor, the OOW should:

- ensure that inspection rounds of the ship are made periodically
- observe meteorological and tidal conditions and the state of the sea
- ensure that the state of readiness of the main engines and other machinery is in accordance with the master's instructions.

The OOW and duty seaman were on a 4-on, 8-off schedule for navigation watches, including those at anchor. In addition to maintaining a proper lookout, periodic inspection rounds were to be carried out by the duty seaman, and were to include checks on the anchor cable, the cable stopper and the windlass brake. The OOW was required to remain on the bridge at all times.

After anchoring *Royal Pescadores* on 6 May, the master stood down the duty seamen from bridge watchkeeping duties. He had decided to rest them because of their earlier long working hours when cleaning the cargo holds.

When ringing finished with engines after anchoring, the master advised the chief engineer that the main engine would not be required until preparations for berthing in Kwinana. At interview, *Royal Pescadores'* master indicated that it usually took about 1 hour to prepare the main engine for manoeuvring.

On 7 May, a number of BoM forecasts and warnings for strong winds were received. In the time leading up to the incident, the weather recorded in *Royal Pescadores'* deck log book indicated north-westerly winds between force 5 and force 7 (that is, up to 33 knots) with 4 to 5 m seas and a 2 m swell.

The master's night orders for the OOW on 7-8 May night stated:

Vessel only one anchor; keep a sharp lookout and check anchor position on time.

Notify all vessels movements nearby.

Keep watch on channels 12 and 16.

Carry out safety and fire patrol.

Call me if there is any doubt.

The night orders did not provide for any regular rounds to be made on deck during a watch, nor was there a specific reference to the adverse weather conditions or the status of the main engine. As the sole watchkeeper, the OOW could only make safety or fire rounds (and possibly rounds on deck) at the change of a watch, that is, every 4 hours. The requirement to 'call the master if there is any doubt' loosely covered any contingencies, including a deterioration in weather conditions.

The requirement for the OOW to remain on the bridge resulted in no one making rounds of the forecastle deck to check the anchor cable and cable stopper. Consequently, the open stopper bar and its unsecured pin went undetected. While the master's night orders loosely included some provisions for contingencies, they were ineffective and the OOW did not call the master as the weather continued to deteriorate.

At 0534 on 8 May, the noise from the wind and rain woke the master. He then checked with the chief mate, who indicated that the ship was maintaining position. However, even at that late stage, no one considered placing the main engine in a state of readiness appropriate for the weather conditions.

In contrast, *Da Heng Shan's* master had the ship's main engine at 10 minutes readiness due to the forecast weather. The short notice made it possible for the engine to be used in an attempt to avoid the collision.

In response to the emergency, *Royal Pescadores'* main engine was hurriedly prepared. However, by the time it was started, about 15 minutes after the anchor cable was lost, the collision had

already occurred. Had the engine been available at short notice appropriate for the weather conditions, it could have been used to avoid the collision.

Bitter end securing arrangement

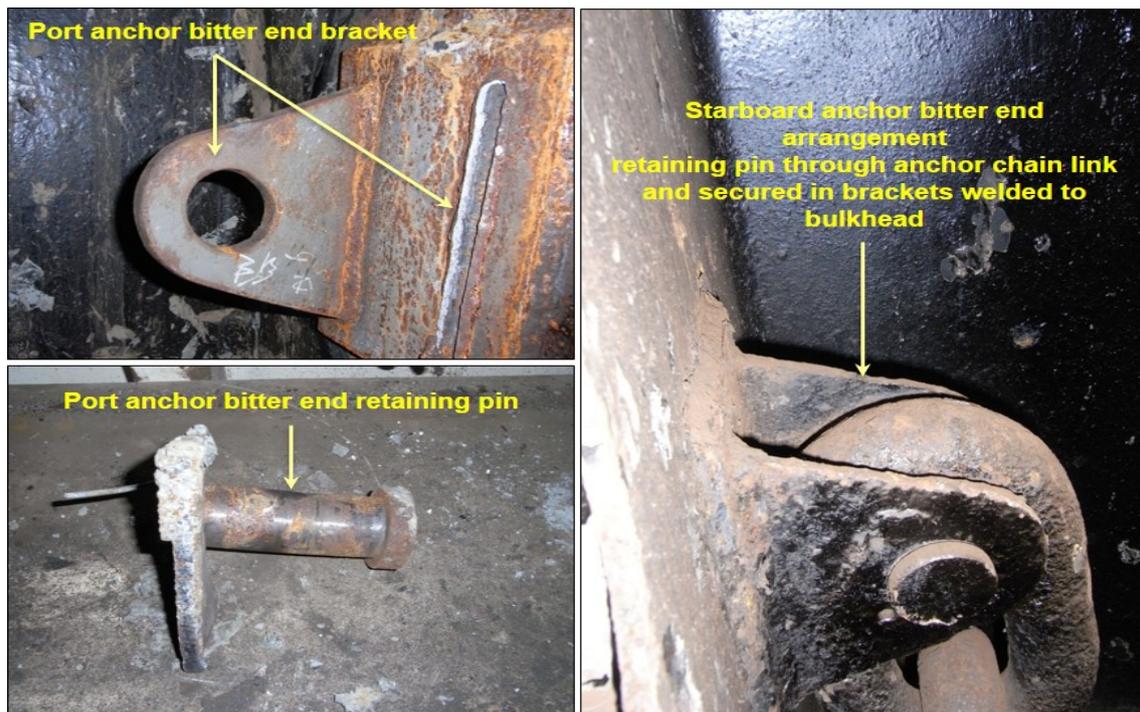
While it did not contribute to the incident, *Royal Pescadores'* anchor cable bitter end securing arrangement was contrary to recognised design recommendations intended to reduce risk. The relevant International Association of Classification Societies (IACS) recommendation states:

The fastening [that is, the securing arrangement of the bitter end] is to be provided with a means suitable to permit, in case of emergency, easy slipping of the cable to sea, operable from an accessible position outside the chain locker.¹⁸

The IACS recommendation is intended to provide a safe means of releasing the cable in an emergency from outside the chain locker, to ensure no one enters the locker. The locker is an enclosed space designed to self-stow the anchor cable and it is dangerous to enter the space, particularly if the cable is under load.

The bitter end securing arrangement on board *Royal Pescadores* could only be released from inside the chain locker (Figure 7). Therefore, releasing it would involve entering the locker and an exposure to high risk of serious injury, particularly in an emergency.

Figure 7: *Royal Pescadores'* bitter end securing arrangements inside the chain locker



Source: ATSB

In its submission to the draft investigation report, the ship's managers, Shih Wei Navigation, advised that it had consulted ClassNK on the matter. ClassNK advised Shih Wei Navigation that there was no requirement for the ship to have been fitted with a bitter end release arrangement outside the chain locker.

¹⁸ Requirements for the windlass and its associated fittings. Recommendation No. 10, 1.2.2 (b) of 'IACS Rec. 84/Corr. 2004/Rev.2 2005'.

Further, in submission to the draft report, ClassNK advised the ATSB that:

We consider that there is no connection between this incident and the ship's anchor cable's bitter end securing arrangement. Moreover, we don't think that any action is necessary based on this matter considering the above situation.

This arrangement has been specified in IACS Recommendation No.10 since 1982 and it remains as a recommendation (not a mandatory requirement) because there have been no reports of casualties caused due to the lack of an easy slipping arrangement of the cable so far.

However, the response from ClassNK does not adequately address the issue of higher exposure to risk by not following the IACS recommendation. Further, the response does not recognise best practice and implies that the recommendation is unnecessary.

Port State Control inspection

A Port State Control (PSC) inspection is undertaken by a national maritime regulator in its country's ports to verify that the condition of a foreign ship and its equipment complies with international regulations, and that it is manned and operated in compliance with those regulations. During the inspection, the inspector conducts an initial inspection,¹⁹ which usually requires 3 to 5 hours, depending on ship type, condition, and the nature of any deficiencies identified. This inspection's findings determine if a subsequent, more detailed inspection²⁰ is required.

At the time of the incident, *Royal Pescadores* was detained by AMSA under PSC and required to remain within port limits. The PSC inspection of the ship on 2 May had identified multiple deficiencies, including maintenance, housekeeping and record-keeping issues. A more detailed inspection was then undertaken in accordance with PSC procedures²¹ and the ship was subsequently detained. The deficiencies had to be rectified and re-inspected by AMSA before the ship could be released and leave port limits.

When AMSA detains a ship, its master is served with the detention document, which describes the grounds for its detention. The ship's release, after specified requirements have been complied with, is formalised by serving the master with an order for its release. When a ship is detained or released, AMSA also notifies the flag State and the relevant classification society.²²

In most cases, it is usual for the port authority, harbour master, VTS, pilotage provider and others responsible for managing port operations to become aware of the circumstances of a ship's detention. The information can come from the ship's master or agent, or the regulator, and allows relevant parties to better manage the ship's port stay, including any safety aspects.

Fremantle Ports received verbal advice from AMSA that *Royal Pescadores* had been detained, and this information was promulgated to the port's marine operations staff and VTSOs. However, Fremantle Ports was not made aware of the nature of the ship's deficiencies and their implications, if any. Before the ship was shifted from its berth to the anchorage though, the duty harbour master did request and receive approval from AMSA for the ship to be shifted.

In submission to the draft report, AMSA advised that it considers any outstanding deficiencies before allowing a detained ship to be taken to anchorage. Should concerns exist, such as

¹⁹ An initial inspection comprises of a visit on board to verify the ship carries the necessary valid certificates and documentation. Inspectors also examine areas critical to the safe operation of the ship in order to form an opinion as to whether the vessel is in compliance with those certificates and the overall condition of the ship, its equipment and its crew.

²⁰ A more detailed inspection is carried out whenever there are clear grounds for believing, during an inspection, that the condition of the ship or of its equipment or crew does not substantially meet the relevant requirements of a relevant instrument.

²¹ IMO Resolution A.1052 (27).

²² Details of all detentions are also forwarded to the International Maritime Organization. As Australia is a party to the Memoranda of Understanding (MOU) on Port State Control in the Asia-Pacific and Indian Ocean regions, information on detained ships is published on the respective MOU websites.

anchorage locations, those concerns are raised with the port authority. Additionally, AMSA also advised that it routinely verbally advises the port authority about a ship's detention, which offers the opportunity for open discussion on the nature of the detention.

While AMSA advises port authorities when ships are detained under PSC, those advisories do not routinely include information on the reasons or deficiencies for the detention. Unless specific inquiries are made in this regard, port authorities are unable to consider the implications of any such detentions when arranging for the subsequent movement of detained ships within the port limits.

Weather related matters

On 7 May, the BoM-issued strong wind warnings for the Perth local waters, which include Fremantle, were promulgated at 0400, 1100 and 1600. The strong wind warning was cancelled at 2200 but later re-issued at 0400 on 8 May. The warning was effective until midnight that day and winds of 28 to 33 knots were predicted. It is important to note that all BoM-issued warnings include the following caveat as a preamble.

Please be aware: Wind gusts may be a further 40 per cent stronger than the average given here, and maximum waves may be up to twice the height.

Weather forecasts issued at 0800 and 1500 on 7 May for the general area provided information on the weather system causing the strong winds, and stated:

Satellite imagery shows a vigorous cold front and an associated cloud band out to the west of the state that will impact the south-west and west coasts tonight, before pushing through the state tomorrow. This front will produce widespread rain with heavy falls possible, isolated thunderstorms, and fresh to strong winds.

Expect fresh N/NW winds this afternoon, becoming strong W'ly overnight tonight and throughout tomorrow, tending SW'ly and moderating on Friday morning. Also expect widespread showers and isolated, gusty thunderstorms from this afternoon, continuing throughout tonight and tomorrow before gradually easing on Friday and Saturday.

Therefore, mariners in Fremantle port and the VTS had information at hand to sufficiently inform them of the likely weather conditions, including the strong winds and adverse weather expected.

Fremantle Ports

Fremantle Ports' Port Marine Safety Risk Assessment document identifies a number of risk events and prescribes risk controls to manage those events. Events related to the outer harbour include ships dragging anchor, contacting other anchored ships or grounding. The risk level associated with these events was stated as 'low' and are managed by routine procedures.

The risk control for the events noted above are included in the VTS operational procedures and refer the VTSO to BoM-issued weather warnings. The relevant part of the procedure states:

Upon receipt of a severe weather or gale warning, VTSOs are to ensure that a standby tug has been fully crewed both in the Inner Harbour and the Outer Harbour...

Therefore, a BoM warning for winds exceeding 34 knots should trigger the above response by the VTSO. During adverse weather, when unintended vessel movements can occur, the procedures require the VTSO to monitor anchored ships with increased vigilance using the 'anchor watch' function of the monitoring system. Should any doubt arise, or a developing situation cause concern, the VTSO is required to contact the duty harbour master.

Real-time wind information is available to VTSOs, and 10-minute average speed, direction and maximum gust at the Fremantle Ports Signal Station is recorded (the sensors are located on top of the station building). The VTSO regularly records these readings in the VTS log.

Between 1800 and midnight on 7 May, the VTS log indicated that the local wind speed ranged from 9 to 21 knots, with gusts up to 34 knots. Recorded wind speeds were in the range of strong to gale force winds.

At 0335 on 8 May, the duty VTSO asked a ship dragging its anchor to re-anchor. Shortly thereafter, an inbound pilotage was cancelled due to the deteriorating weather. At 0535, when *Royal Pescadores* lost its anchor and cable, the wind speed recorded by VTS was 37 knots with gusts to 56 knots (that is, gale and storm force winds). However, these conditions did not result in the VTSO either mobilising the tug crews or contacting the duty harbour master.

At 0547, the BoM issued a 'severe thunderstorm'²³ warning with 'damaging winds'²⁴ accompanied by gusts to 55 knots. At about 0600, the VTSO called the duty harbour master and informed him regarding the situation. However, it was not until 0645 that instructions (ordered by the duty harbour master) were issued to crew the standby tugs. The tugs were manned after about 45 minutes.

The Fremantle vessel traffic service operational procedures were aimed at having precautionary measures in place for adverse weather conditions. However, the triggers specified in the procedures only referred to BoM-issued severe weather and gale warnings. As no local wind speed limits were specified, the gale force winds recorded at Fremantle port throughout the early hours of 8 May did not trigger the procedural responses until 0600 – after the receipt of BoM-issued warnings.

In submission to the ATSB draft investigation report, Fremantle Ports Authority stated their operational procedures already detailed the actions to be taken upon receipt of weather warnings. However, they acknowledged the procedures did not detail the actions to be taken when experiencing actual gale force winds (34 to 47 knots, Force 8 to 9), without a weather warning.

These procedures were initially written with the expectation that the warning is received ahead of the actual bad weather, and as such, if action is taken when the message is received then it will be implemented and in place at the actual time of onset of the strong or severe weather.

²³ BoM defines a severe thunderstorm as a thunderstorm that produces two or more of the following: a tornado, hail greater than 2 cm in diameter, wind gusts of 90 km/h (48.5 knots) or greater, very heavy rain leading to flash flooding.

²⁴ 'Damaging winds' is defined by the Bureau of Meteorology as sustained wind speeds between 63 km/h and 88 km/h with gusts between 90 km/h and 125 km/h.

Findings

From the evidence available, the following findings are made with respect to the collision between *Royal Pescadores* and *Da Heng Shan* that occurred at 0548 on 8 May 2014, during adverse weather conditions while at anchor off Fremantle, Western Australia. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

Safety issues, or system problems, are highlighted in bold to emphasise their importance.

A safety issue is an event or condition that increases safety risk and (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operating environment at a specific point in time.

Contributing factors

- At some time before 0530 on 8 May 2014, in adverse weather conditions, the securing pin from *Royal Pescadores*' port anchor chain cable stopper bar worked free. As a result, the bar opened and the cable's load came onto the windlass brake.
- The windlass brake did not hold and the anchor cable ran out to its inboard (bitter) end. At about 0535, the securing arrangement of the bitter end gave way and the entire cable was lost into the sea.
- **The poor condition of *Royal Pescadores*' anchoring equipment was indicative of inadequate maintenance. The shipboard management team were not aware of the equipment's maintenance history nor able to provide relevant documents from the ship's planned maintenance system. [Safety Issue]**
- As the sole watchkeeper, *Royal Pescadores*' officer of the watch was required by the ship's procedures to remain on the navigation bridge at all times. As such, routine rounds of the forecastle deck were not undertaken and no one detected that the cable stopper's securing pin was working free.
- *Royal Pescadores*' main engine was not in an appropriate state of readiness for the adverse weather conditions forecast and the warnings issued by the Bureau of Meteorology (BoM).

Other factors that increased risk

- **The International Association of Classification Societies (IACS) recommendation for having a means of slipping the anchor cable bitter end outside the chain locker had not been provided on board *Royal Pescadores*. Further, the ship's classification society, ClassNK, does not consider that the IACS recommended slipping arrangement is necessary for reducing safety risk. [Safety Issue]**
- **While the Fremantle vessel traffic service (VTS) operational procedures were aimed at having precautionary measures in place for adverse weather conditions, the triggers specified in the procedures only referred to BoM-issued severe weather and gale warnings. As no wind speed limits were specified, the gale force winds recorded throughout the early hours of 8 May did not trigger the procedural responses until 0600, after the receipt of BoM-issued warnings. [Safety Issue]**

Other findings

- While the Australian Maritime Safety Authority advises port authorities when ships are detained under Port State Control, those advisories do not routinely include information on the reasons or deficiencies for the detention. Unless specific inquiries are made in this regard, port authorities are unable to consider the implications of any such detentions when arranging for the subsequent movement of detained ships within the port limits.

Safety issues and actions

The safety issues identified during this investigation are listed in the Findings and Safety issues and actions sections of this report. The Australian Transport Safety Bureau (ATSB) expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the ATSB prefers to encourage relevant organisation(s) to proactively initiate safety action, rather than to issue formal safety recommendations or safety advisory notices.

All of the directly involved parties were provided with a draft report and invited to provide submissions. As part of that process, each organisation was asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue relevant to their organisation.

Planned and other maintenance

Number:	MO-2014-003-SI-01
Issue owner:	Shih Wei Navigation
Operation affected:	Marine: Shipboard operations
Who it affects:	All persons charged with maintaining equipment

Safety issue description:

The poor condition of *Royal Pescadores*' anchoring equipment was indicative of inadequate maintenance. The shipboard management team were not aware of the equipment's maintenance history nor able to provide relevant documents from the ship's planned maintenance system.

Proactive safety action taken by Shih Wei Navigation

Action number: MO-2014-003-NSA-022

Action status: Closed

The ship's managers, Shih Wei Navigation, investigated the incident and acknowledged shortcomings in the implementation and completion of shipboard planned maintenance. The ship's managers attributed these shortcomings to a lack of familiarisation with the ship's safety management system (SMS), its implementation, and oversight of that by the company.

Shih Wei Navigation advised that it has taken the following safety action:

- issuing a relevant safety circular to its fleet for discussion at shipboard safety meetings
- requiring shipmasters to place greater emphasis on crew familiarisation with the SMS
- requiring company superintendents to focus on completion of planned maintenance.

Current status of the safety issue

Issue status: Adequately addressed

Justification: The ATSB considers that the proactive safety action taken will adequately address this safety issue.

Bitter end securing arrangement

Number:	MO-2014-003-SI-02
Issue owner:	Shih Wei Navigation and ClassNK
Operation affected:	Marine: Shipboard operations
Who it affects:	All persons responsible for ship and crew safety

Safety issue description:

The International Association of Classification Societies (IACS) recommendation for having a means of slipping the anchor cable bitter outside the chain locker had not been provided on board *Royal Pescadores*. Further, the ship's classification society, ClassNK, does not consider that the IACS recommended slipping arrangement is necessary for reducing safety risk.

Proactive safety action taken by Shih Wei Navigation

Action number: MO-2014-003-NSA-021

Action status: Closed

Shih Wei Navigation consulted ClassNK, the ship's classification society to clarify the matter and was advised that there was no requirement for the ship to have been fitted with a bitter end release arrangement outside the chain locker.

However, in recognition of the IACS recommended best practice and associated risk reduction, Shih Wei Navigation instructed its new ship building division to review the bitter end release arrangements provided on new ships. All the company's recently built ships are provided with the recommended arrangements. Further, the company will fit all new ships in future in accordance with the IACS recommendation.

Response to safety issue by ClassNK

ClassNK advised the ATSB that it considers the recommended arrangements specified in the IACS recommendation are unnecessary as there have been no reported casualties caused by the lack of an external slipping arrangement.

ATSB safety advisory notice to International Association of Classification Societies (IACS)

Action number: MO-2014-003-SAN-020

Action status: Released

The Australian Transport Safety Bureau advises the International Association of Classification Societies (IACS) that it should consider the safety implications of there being no requirement for its members to follow best practice with respect to anchor cable bitter end securing arrangements, consistent with IACS Recommendation No. 10, 1.2.2 (b).

Current status of the safety issue

Issue status: Partially addressed

Justification: Proactive safety action has been undertaken by Shih Wei Navigation, and the ATSB has issued safety advisory notice MO-2014-003-SAN-020.

Weather related matters

Number:	MO-2014-003-SI-03
Issue owner:	Fremantle Port Authority (Fremantle Ports)
Operation affected:	Marine: Shore-based operations
Who it affects:	All ships operating in the Port of Fremantle

Safety issue description:

While the Fremantle vessel traffic service (VTS) operational procedures were aimed at having precautionary measures in place for adverse weather conditions, the triggers specified in the procedures only referred to BoM-issued severe weather and gale warnings. As no wind speed limits were specified, the gale force winds experienced at Fremantle throughout the early hours of 8 May did not trigger the VTS procedural responses until 0600 – after the receipt of BoM-issued warnings.

Proactive safety action taken by Fremantle Port Authority (Fremantle Ports)

Action number: MO-2014-003-NSA-023

Action status: Closed

Fremantle Ports advised the ATSB that it has taken the following safety action:

- subscription to the Weatherzone weather program, specifically configured for Fremantle Ports, displaying real time weather data
- weather, wind and lighting warning messages automatically sent to designated staff and pilots
- VTS officers are trained in the use of the Weatherzone program and the interpretation of data to identify deteriorating weather conditions
- a new weather station and upgraded VTS equipment with enhanced vessel plotting and monitoring systems has been installed at the VTS tower
- amendments to VTS operational procedures instructing the VTS officers to contact the duty harbour master if there is any risk or concern, or if gale force winds are experienced
- six ShoreTension Devices²⁵ have been installed in the inner harbour, and six further such devices are to be installed.

Current status of the safety issue

Issue status: Adequately addressed

Justification: The ATSB considers that the proactive safety action taken will adequately address this safety issue.

²⁵ The ShoreTension is a flexible stand-alone mooring system, based on a permanent tension of shore mooring lines without the need of external energy. It reduces the movements of a moored vessel caused by strong wind, current or passing vessels.

General details

Occurrence details

Date and time:	8 May 2014 – 0548 UTC + 8 hours	
Occurrence category:	Serious incident	
Primary occurrence type:	Collision	
Location:	Gage Roads Anchorage, Fremantle, Western Australia	
	Latitude: 32° 03' S	Longitude: 115° 44' E

Ship details

Name	<i>Royal Pescadores</i>
IMO number	9151400
Call sign	3FIJ7
Flag	Panama
Classification society	ClassNK
Ship type	Geared bulk carrier
Builder	Shikoku Dockyard, Japan
Year built	1997
Owner(s)	Royal Pescadores SA
Operator	Shih Wei Navigation Co Ltd
Manager	Shih Wei Navigation Co Ltd
Gross tonnage	11,246
Deadweight (summer)	18,369 t
Summer draught	9.12 m
Length overall	148.170 m
Moulded breadth	22.80 m
Moulded depth	12.20 m
Main engine(s)	B&W 7S35MC
Total power	4,891 kW
Speed	16.10 knots
Damage	Port anchor and cable lost. Minor indentation to starboard quarter shell plating.

Name	<i>Da Heng Shan</i>
IMO number	9564815
Call sign	VRFX9
Flag	Hong Kong
Classification society	Bureau Veritas
Ship type	Asphalt/Bitumen Tanker
Builder	China Gezhouba Group
Year built	2009
Owner(s)	Max Prime International
Operator	Tianjin Southwest Maritime
Manager	Tianjin Southwest Maritime
Gross tonnage	5,493
Deadweight (summer)	6,193 t
Summer draught	6.50 m
Length overall	106.84 m
Moulded breadth	17.60 m
Moulded depth	10.10 m
Main engine(s)	Yanmar 8N330-EN
Total power	3,310 kW
Speed	13.40 knots
Damage	minor damage to forecastle shell plating

Sources and submissions

Sources of information

On 8 May 2014, investigators from the Australian Transport Safety Bureau (ATSB) attended *Da Heng Shan* and *Royal Pescadores* while the ships were at anchor off Fremantle, Western Australia. The master and directly involved crew members from both ships were interviewed and each provided their account of the incident. In addition, Fremantle Ports Deputy Harbour Master and the duty VTS officer were interviewed and each provided their account of the incident. Photographs of the ship and copies of relevant documents were obtained, including log books, statutory certificates, reports, manuals and procedures.

A draft of this report was provided to *Royal Pescadores*'s master, chief mate, its managers, Shih Wei Navigation, *Da Heng Shan*'s master and chief mate, the Australian Maritime Safety Authority (AMSA), Fremantle Port Authority (FPA) and duty VTSSO, ClassNK and the Hong Kong Marine Accident Investigation office.

Submissions were received from Shih Wei Navigation, AMSA, FPA, ClassNK and the Hong Kong Marine Accident Investigation office. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly

Appendices

Appendix A – Australian Government Bureau of Meteorology Marine weather services

The Australian Bureau of Meteorology (BoM) provides weather forecasts, warnings and observations for coastal waters areas and high seas around Australia.

Marine forecasts

Forecasts for wind speed and direction, and sea and swell heights are issued twice daily for:

- coastal waters – areas within 60 miles of the coast
- high seas – areas beyond the coastal waters.

Marine weather warnings

Marine weather warnings are issued whenever strong winds, gales, storm force or hurricane force winds are expected. The following warnings are provided:

- coastal waters wind warnings
- ocean wind warnings – issued to ships at sea whenever gale, storm or hurricane force winds are expected
- severe weather warnings – provided for potentially hazardous or dangerous weather that is not directly related to severe thunderstorms, tropical cyclones or bushfires.

Marine wind warnings aim to provide around a 24-hour lead time and are normally renewed every six hours.

Wind speed criteria

Within the coastal and ocean weather warnings, the BoM use the following wind speed criteria:

- Strong wind: 26 to 33 knots, Force 6 to 7 (Beaufort scale)
- Gale: 34 to 47 knots, Force 8 to 9
- Storm force wind: 48 to 63 knots, Force 10 to 11
- Hurricane force wind: 64 knots or more, Force 12.

Severe weather warnings

Severe weather warnings are issued for:

- sustained winds of gale force (63 km/h, 34 knots) or more
- damaging wind gusts of 90 km/h (48 knots) or more
- destructive wind gusts of 125 km/h (67 knots) or more
- very heavy rain that may lead to flash flooding
- abnormally high tides (or storm tides) expected to exceed highest astronomical tide by 0.5 m
- unusually large surf waves expected to cause dangerous conditions on the coast.

These warnings are updated every 6 hours.

Severe thunderstorm

A severe thunderstorm is defined by the Bureau of Meteorology as one which produces:

- hail, diameter of 2 cm or more
- wind gusts of 90 km/h (48 knots) or greater

- flash floods
- tornadoes
- any combination of these.

Severe thunderstorm warnings do not include tide or wave information. These warnings are issued if the severe phenomena are directly caused by the thunderstorm and are usually issued every 3 hours.

Terms used

Wind speed is the average speed of the wind over a 10-minute period at a height of 10 metres above the surface level.

Gusts are increases in wind speed lasting for just a few seconds. The speeds are typically 30 to 40 per cent higher than the average wind speed, but stronger gusts are likely in the vicinity of showers, thunderstorms and frontal systems.

A squall is an abrupt and large increase in wind speed that usually only lasts for minutes then diminishes rather suddenly.

Wind direction is given in 8 compass points for forecasts and 16 for observations and is the direction the wind is coming from.

Recipients are further cautioned that maximum wave heights may be up to twice the height of those forecast (average).

More information is available from the [BoM](#) website.

Australian Transport Safety Bureau

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

Australian Transport Safety Bureau

Enquiries 1800 020 616

Notifications 1800 011 034

REPCON 1800 011 034

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Investigation

ATSB Transport Safety Report

Collision between Royal Pescadores and Da Heng Shan
Gage Roads Anchorage, Fremantle, Western Australia
8 May 2014

308-MO-2014-003

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