Departmental investigation into the grounding of the Australian flag bulk carrier FITZROY RIVER at the port of Weipa on the 24 August 1998

136

MIIU

COMMONWEALTH DEPARTMENT OF TRANSPORT AND REGIONAL SERVICES

Contents

Navigation Act 1912
Navigation (Marine Casualty) Regulations
investigation into the grounding of the
Australian flag bulk carrier
FITZROY RIVER
at the port of Weipa
on the 24 August 1998

Published: June 1998

ISBN 0 642 20020 3

The Investigation into marine casualties occurring within the Commonwealth's jurisdiction are conducted under the provisions of the Navigation (Marine Casualty) Regulations, made pursuant to sub section 425 (1) (ea) and 425 1 (AAA) of the Navigation Act 1912. The Regulations provide discretionary powers to the Inspector to investigate incidents as defined by the regulations. Where an investigation is undertaken the Inspector must submit a report to the Secretary of the Department. It is Departmental policy to publish such reports in full as an educational tool.

For further information please contact:

Inspector of Marine Accidents
Marine Incident Investigation Unit
P O Box 594 CANBERRA ACT 2601
AUSTRALIA

Phone: +61 2 6274 7324
Fax: +61 2 6274 6699
Email: miiu@miiu.gov.au

MIIU on the INTERNET

Information relating to this report and other marine investigation reports can be located from the Marine Incident Investigation Unit's Internet homepage at our URL: http://www.miiu.gov.au.htm

Summary

The Australian steam turbine bulk carrier *Fitzroy River* sailed from the Lorim Point bauxite berth, Weipa, at about 1800 on
24 August 1998. The Master, who held a pilotage exemption certificate for the port, conducted the outward pilotage.

The outward passage proceeded routinely between Lorim Point jetty and Gonbung Point. After executing the turn to starboard off Gonbung Point, the Master found that the ship was south of the intended course line and he steered a course into the “Bellmouth” to compensate.

With the ship steering a course of about 285°, and when the bridge was on the line of leads marking the centre of the South Channel, the Master ordered port rudder to turn the ship into the South Channel. Very soon afterwards, the Master realised that the ship was not turning fast enough and he ordered full port rudder.

The ship’s heading had reached 240° when the bow grounded on a spit of shoal water extending about 200 m east-north-east from Bn.18, which marks the north bank of the inner eastern end of South Channel. Immediately the engine was put to about 70 rpm astern, but the ship proved to be securely aground with the bow about 130 m from Bn.18 on a heading of 243°.

The Master reported the grounding to the ship’s managers and the ASP Ship Management emergency plan was activated.

The ship was refloated the following morning with the assistance of tugs. Nobody was injured as a result of the grounding and no pollution resulted.

An inspection of the ship showed that it had sustained no material damage and the vessel was able to continue in service.

Sources of Information

The Master, Deck Officers, Engineering Officers, Helmsman and Chief Integrated Rating of *Fitzroy River.*

ASP Ship Management

The Regional Harbour Master, Cairns

Bureau of Meteorology

Bureau of Transport Economics

Queensland Department of Transport

Acknowledgement

The Inspector is indebted for advice form Captain A Boath, Regional Harbour Master, Cairns; Captain M Lutze, Regional Harbour Master, Gladstone; Captain A Lawson, Pilot Weipa; and Captain G Ring, former Pilot.

The Inspector acknowledges the assistance of the Queensland Department of Transport, Maritime Services Branch in providing tidal and depth information for the Port of Weipa.

Portion of chart Aus 4 reproduced by permission of the Hydrographic Office, RAN.

Photograph of *Fitzroy River* supplied by ASP Ship Management.

Narrative

Fitzroy River

The Australian flag ship *Fitzroy River* is a bulk carrier of 75,105 tonnes deadweight at a draught of 12.224 m. Built in Italy for TNT Pty Limited, and designed for the bauxite trade through the inner route of the Great Barrier Reef between Weipa and Gladstone, it was commissioned in 1983. *Fitzroy River* is managed by ASP Ship Management.

The vessel is 255 m in length overall, it has a beam of 35.36 m, a moulded depth of 19.0 m and has three cargo holds serviced by eight hatches. The engine room and accommodation are aft, the forward end of the bridge being 216 m from the stem. The ship is propelled by steam turbines, powered by a single coal fired boiler, driving a single propeller giving a speed in ballast of about 14.5 knots. The vessel operates under unmanned machinery space (UMS) certification and the propulsion is normally controlled from the bridge, though engineers routinely man the engine control room while the ship is manoeuvring. All engine movements are recorded automatically and printed on a paper roll.

The ship was fitted with a large rudder designed for manoeuvring in restricted ports and waterways.

The bridge equipment includes a GPS display, two radars (both of which are Automatic Radar Plotting Aids - ARPA), gyro compass and bearing repeaters, automatic steering and a course recorder. There are also two VHF sets and a watch alarm on the bridge.

The vessel has a crew of 21, who work about six weeks on and six weeks off on alternate “swings”. At sea, bridge watches consist of an officer and an integrated rating. At night the integrated rating acts as a lookout and is available to steer the vessel manually should it be necessary to override the automatic pilot. In port the Second and Third Mate each work six hour watches, allowing the Mate to supervise all critical areas of loading and discharging.

The Port of Weipa

The port of Weipa, a loading port for bauxite, is on the northern bank of the Embley River, on the western side of the York Peninsula, far north Queensland.

In 1997/98 the port of Weipa recorded 208 ship visits of which 164 were bulk carriers. The four vessels under management by ASP Ship Management completed 110 visits, accounting for 67 per cent of all bulk bauxite ship movements. (The number of ship's visiting Weipa in 1988/89 was 293 and in 1991, 224.)

Entry to the port is by way of the dredged South Channel, which is maintained to a depth of 10.8 m and extends 7 miles seaward of Urquhart Point, at the mouth of the Embley River. The channel is marked by nine pairs of beacons and a fairway beacon. All lights on the beacons are synchronised. The port itself consists of three berths to the north of Cora Bank; Evans Landing, Humbug Point and the bauxite jetty at Lorim Point. The port operates on a minimum underkeel clearance of 0.9 meters.

Deep draught bauxite ships sail about 75 minutes before high water, on the last of the flood tide, by way of the channel north of Cora Bank, which has a minimum depth of 10.7 m below chart datum (lowest astronomical tide). The aim is for ships to reach the western end of South Channel at high water. Normally bulk carriers loading bauxite for Gladstone, or other east coast ports, will load to the maximum permissible draught, limited by either the rise of tide at Weipa or the tidal window in Torres Strait, whichever is the least depth.

Large vessels berth at Lorim Point on high water just before, or at, high water when the tidal flow is at its minimum. Ships normally berth starboard side to and approach the Lorim Point jetty by way of the channel south of Cora Bank, which has a minimum depth of 7.4 m.

The port is subject to strong tidal flows, particularly on the ebb tide with rates of 4.5 knots at Lorim Point setting to the west. On the flood tide there is an easterly set of about one knot. In the area between Gonbung Point and Urquhart Point the tide runs east-south-east, and follows the line of the channel to the north and south of Cora Bank. The rate of set is dependent on a number of variables, including the range of tide, barometric pressure, prevailing wind strengths and duration.

Because of their length, large vessels of the size of *Fitzroy River* can experience a southerly set on the bow and a northerly set on the stern when clearing Gonbung Point. Similarly, when entering the South Channel, the bow may not be affected by any lateral set while the stern is subject to a marked south-easterly set.

Pilotage, which is compulsory, is exacting. Anticipating the current and correctly positioning the vessel is critical. Masters trading regularly to the port may gain exemption after undertaking qualifying voyages of eight passages in and eight out and satisfactorily completing a written exam.

The Incident

23 August

Fitzroy River navigated the approaches to Weipa and berthed at Lorim Point bauxite berth in the early hours of 23 August, under the command of its Master, who held a pilotage exemption. The ship was due to sail at 0400 on 24 August.

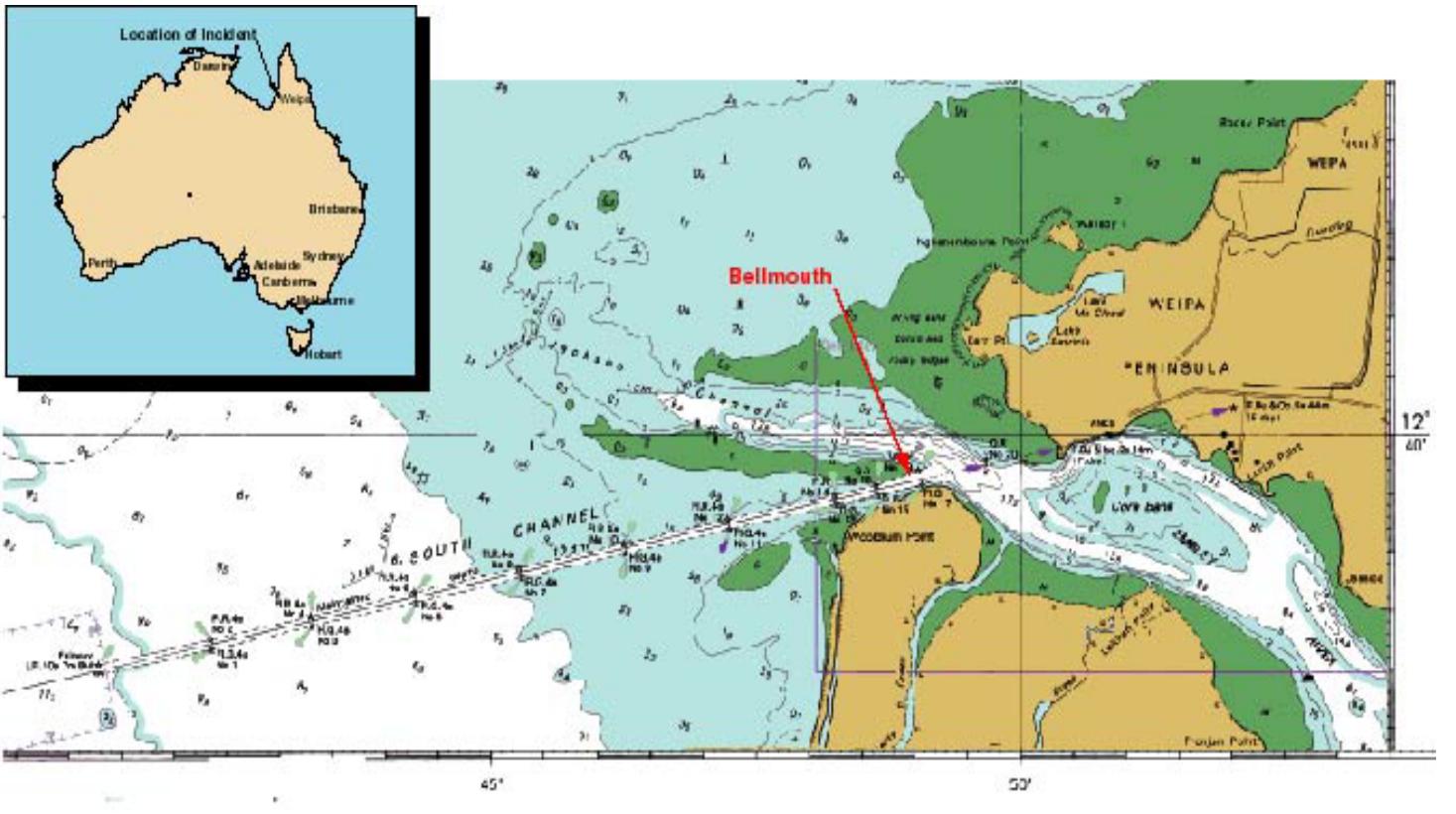
Normal cargo loading watches were maintained by the officers with the Second and Third Mates maintaining six hour watches, with the Mate on call. During the morning the Master was engaged in routine office work. In the afternoon he cycled to Weipa for a swim and later he went to the library. He arrived back on board by early evening.

At about 2000 the Master received notice that sailing would be delayed until 1800 on 24 August as the stockpile of bauxite would not permit the required loading rate to be maintained.

24 August

Loading was suspended at 0314 on 24 August for 6½ hours and was completed at 1555. A draught survey provided ship's figure for the quantity loaded and the sailing draught was 11.7 m forward and 11.87 m aft. At 1700 the bridge equipment and steering were tested and the clocks synchronised. A minor repair was made to the echo sounder and all other equipment was found to be working satisfactorily.

At 1745 the crew stood by at stations and soon afterwards the gangway was recovered. The engine was



Portion of chart Aus4 showing entrance channel to Weipa

put on ‘stand-by’ at 1800 and a tug was made fast forward. The engine was switched to bridge control and both steering motors were running. The Master briefed the Mate on aspects of the outward pilotage and in particular asked him to monitor the transit of Bn.25 and Bn.33; these would be brought in line or nearly in line astern as *Fitzroy River* rounded Bn.28 off Gonbung Point.

On the bridge were the Master, Mate and the Integrated Rating of the watch as helmsman. The wind was about force 4 on the Beaufort Scale (11-16 knots) from the south-east and the tide on the flood, 1.8 m above datum. The Australian National Tide Tables predicted a height of tide of 2.0 m above datum at high water at 1910.

At 1802 the ship’s moorings were singled up forward and aft, full starboard rudder was applied and, at 1803, the final ropes were let go. The tug lifted the bow off the wharf and the rudder was returned to amidships. At 1806:26 the ship’s telegraph was set to about 30 rpm. About three minutes, later at 1810, the tug was released and the engine speed increased to about 50 rpm. At 1817:30, as *Fitzroy River* passed Humbug Wharf, the engine speed was increased to 60 rpm.

The outward passage continued as anticipated. The Master conned the ship from a position just to starboard of the centre line. The Mate was at the telegraph control to the starboard of the centre line of the ship, adjacent to the forward of the two radars. The Mate maintained the “Bridge/Engine Movement Book”, noting times of altering the rpm and the time of passing beacons and landmarks. He left the telegraph control now and again to note the times of passing the beacons on the chart. Although the ship is equipped with a doppler log, the Mate preferred to determine the ship’s speed by fixing a beacon on an electronically generated chart superimposed on the radar screen.

The Third Mate and Chief Integrated Rating remained on the forecastle to let go the anchor if necessary.

Approaching Gonbung Point the Master detected a set to the north, and applied counter helm. As the ship approached Bn.30 at about 1826:30, the Master ordered starboard rudder, initially about 15° and then full starboard rudder. As *Fitzroy River* passed Gonbung Point and Bn.28 at 1828:30 with the ship’s head on 254° the rudder was put amidships. The Master went out to the starboard bridge wing and checked astern. He came into the bridge and asked the Mate if he could see Bn.33. The Mate went to the starboard bridge

wing, accompanied by the Master, to look astern. Although they could see a ship berthing at Lorim Point, neither could make out Bn.33. During this period the ship had continued turning to starboard, but at a reduced rate and at about this time the Mate noted the speed from the radar as 9.1 knots.

The Master realised that the ship was south of the track he wanted to follow and adjusted course from about 280° to 285°, to compensate and get the ship into the optimum position to enter South Channel. As *Fitzroy River* approached Bn.20 the Master and Mate on the bridge, and the Third Mate on the forecastle head, could see the starboard beacons of South Channel opening clear of Urquhart Point. The bridge was abeam of Bn.20 as the green beacons came in line and the Master ordered 15° port rudder. He judged that this would turn the ship to bring it on a line with, or just north of the line, of the port hand beacons. As the ship came in line with the centre leads of South Channel it was obvious to the Master that the ship was not turning rapidly enough and he ordered full port rudder. At 1835:19 the telegraph was put to 70 rpm. The Master called the Third Mate on the forecastle head and asked whether or not the ship would clear Bn.18. The Third Mate replied that it would.

The CIR, who was standing on the after starboard side of the forecastle, realised that something was wrong. The CIR thought that the ship was not aligned as was normal in his experience. As the call from the Master was being made, he went quickly to the forecastle hydraulic motor room at the main deck level on the port side of the forecastle space. He turned the motors on and, as he turned to return to the forecastle head, he heard a grating noise over the noise of the hydraulic motors.

At 1835:30, when *Fitzroy River* had reached a heading of 240° the turn to port stopped and the Master realised that the ship had grounded.

The engine was put to about 70 rpm astern, but the ship proved to be securely aground with the bow about 130 m from Bn.18 on a heading of 243°. The bridge was in position 12° 40.24’ South 141° 49.20’ East, 264°x1.14 miles from the front leading light on Gonbung Point.

Soundings were taken around the ship and the ship’s tanks and spaces monitored for any ingress of water. There was no indication that the hull had been breached. There was no pollution and nobody was injured as a result of the grounding. The Master informed ASP Ship Management of the grounding and the

situation with the ship. The company invoked their emergency plan, which included access to the Lloyd's salvage database for particulars of the ship and the nature of the grounding.

The stand-by tug, *Jupiter,* was called, but it was involved in berthing another bulk carrier at Lorim Point and did not arrive at *Fitzroy River* until just after 1900, a few minutes before the tug *Bellame*, which had also been involved in berthing the inbound ship.

Between 1908 and 1942 the engine was run at various astern rpm, with the tugs assisting, to try to refloat *Fitzroy River*. The starboard anchor was lowered from the hawse pipe and 4 shackles of cable paid out to restrain any astern movement should the ship refloat; this was later increased to five shackles. Further attempts were made to refloat the ship but these were abandoned at about 2300. The decision was made to resume the effort on the rising tide of the next morning, 25 August.

The Master and the ship's deck and engineering officers assessed various aspects of what would be required to refloat the ship, including the taking on of ballast.

Efforts to refloat *Fitzroy River* were resumed at 0415 on 25 August, with two tugs assisting. The ship soon began to pivot and the anchor was recovered. The ship was refloated at about 0710, and once clear, the Master took the ship to anchor south of Cora Bank. On the afternoon of 25 August, a Lloyd's Register of Shipping surveyor made an internal inspection and tested the steering gear. There was no evidence of damage and the ship was cleared to sail on that evening's tide. At Gladstone, divers made an underwater inspection of the hull and reported that the ship had sustained no damage.

Comment and Analysis

Evidence

The Australian National Tide Tables for Weipa for 24 August 1998 predicted a high water of 2.0 m above datum at 1910. The prediction according to the Weipa tide gauge, was for a height of 1.95 m at or shortly after 1900.

Fitzroy River is equipped with a number of recording devices:

- a course recorder detailing the course and helm movement;
- an automatic engine movement recorder;
- an engine data logger;
- an echo sounder; and
- a GPS plot recording details of the position of the ship.

The course recorder, engine movement recorder and echo sounder were synchronised with the bridge clock and were probably accurate to ± 30 seconds. The engine data logger was about eight minutes in error and the GPS plot was between 67 and 68 minutes in error.*

The rudder angle indicator section of the course recorder was not recording the actual rudder applied. Subsequent tests showed that the trace was in error both when port and starboard rudder was applied. These errors seemed uniform and can be correlated with the actual rudder movements.

---

* The GPS plotter was being trialled by the ship. The time discrepancy was known by the ship's staff and allowed for.

Port Rudder - degrees		Starboard Rudder - degrees	
Recorded	Actual	Recorded	Actual
6	10	7	10
11	20	12	20
20	30	21	30
22	Full (35)	21	Full (35)

The Queensland Department of Transport provided records of predicted and actual tidal heights for 24 August and other days. The Queensland Department of Transport also provided charts of current surveys conducted in the years 1980, 1985 and 1990 for the area about the “Bellmouth”.

The Bureau of Meteorology provided the weather observations from Weipa airport for the month of August.

The investigation also utilised records of interview with the Master and crew, as well as the ship’s log book, bell book and other records.

Testing after the grounding

After *Fitzroy River* was refloated and at anchor, a surveyor from Lloyd’s Register of Shipping boarded the vessel to inspect the hull integrity and conduct tests on the steering gear. The hull was found to be intact. The steering gear was shown to be working correctly. The time taken for the rudder to be put from hard to port to hard to starboard was well within the requirements of Chapter II-1 regulation 29 of the Safety of Life at Sea Convention, 1974.

There was no indication that any machinery or equipment failure contributed to the grounding.

Circumstances and causes

The possible causes of the grounding appear to be either a marked variation in tidal flow or human factors such as misjudgment, fatigue, lack of experience or failure in bridge management. It may have been a

combination of some or all of these factors.

The “Bellmouth” and South Channel

The “Bellmouth” in Weipa Harbour is that stretch of water between the shoal water marked by Bn.16 and Bn.18 and the shoal water west of Urquhart Point. The Bellmouth and the Embley River have a reputation for exacting pilotage, having strong and unpredictable tidal flows.

The stretch of water between Cora Bank and Bn.15 and Bn.16 has seen a number of groundings of bulk carriers of 50,000 tonnes deadweight and over at maximum draught. Between 1967 and 1980 twelve bulk carriers either grounded or touched bottom (momentary grounding) between Cora Bank and Bn.7N and Bn.7S (the present Bn.15 and Bn.16 beacons). All were outward bound and eleven of the groundings occurred in the Bellmouth. Of these eleven, there are records of only one ship, the bulk carrier *Darling River* in 1967, grounding on Urquhart Point. Of the ten ships grounding or touching bottom on the north side of the channel, the main problem seemed to be the shoal water lying to the north and east of the present Bn.18.

Despite the best efforts of staff from the Queensland Department of Transport, no record of any incident at Weipa between June 1980 and June 1988 has been found.

The southern edge of the spit was dredged in 1980 increasing the width of the entrance to the South Channel by about 100 m at the eastern extreme – by about 80 m between Bn.17 and Bn.18. Bn.18 was moved about 50 m to the north. However, a spit of shoal water still exists, extending about 240 m ENE from Bn.18.

Following the dredging of the shoal in 1987, six ships, including *Fitzroy River* in this incident, have touched bottom or grounded in the Embley River. All were outward bound bulk carriers at maximum draught, with four of the six having a pilot embarked. Two ships grounded on Cora Bank, while four grounded in or at the eastern entrance to South Channel, the Bellmouth. Three of the incidents have involved grounding or touching the shoal extending from Bn.18.

With the exception of Bn.20 all beacons are set back from the channel, mostly in the order of 30 m.

Bn.18 marks the north side of the eastern end of South Channel and is sited about 27 m from the toe of South Channel. However, the shoal water extends about 240 m east-north-east of the beacon to the ten meter depth contour. It was this tongue of shoal water on which *Fitzroy River* grounded although the ship's bow seemed to be swinging clear of the beacon itself.

Having sailed about 75 minutes before high water, deep draught ships reach the Bellmouth about 30 minutes later, 45 minutes before high water, when the tidal current in the Embley River is slackening.

On outward passages, the critical manoeuvre is to pass Bn.18 allowing for set, so as to position the ship in the centre of South Channel at about Bn.15. The South Channel is narrow, 106 m wide at the toe, and it is important to counteract any "bank effect", which would only compound any wind or tidal effects. At the eastern end of the channel Urquhart Point is close to the channel and the bank profile is steep to. Ships turning too early on to the centre line of the channel are likely to be set to the south, increasing the risk of the tidal stream and particularly the dynamics of "bank effect" setting the ship's stern onto Urquhart Point.

The nature of the mud banks and channel bottom in the Port of Weipa can be said to be forgiving. Ships that have touched bottom have been able to continue on their voyage after inspection. Ships that have grounded have generally been refloated on the following tide and have been able to proceed after ensuring the ship's seaworthiness. Since June 1988, only one bulk carrier *Gold Star*, which grounded on Cora Bank in gale force winds and severely reduced visibility on 14 February 1990, has been subject to a major salvage effort and delay over 24 hours. It was lightered and refloated 11 days later.

However, although the ships may not sustain significant damage, given the tidal pattern in the Prince of Wales Channel, any lost time at Weipa not only impacts on the ship's running costs but can result in significant delays in transiting Torres Strait.

Based on 1988 to present-day figures, the rate of grounding or touching bottom in the Bellmouth is in the order of one in every three hundred movements.

Bank effect, squat and shallow water effect

"Bank effect" and "squat" are critical factors in manoeuvring a ship, particularly a ship at maximum draught and maximum width for any given channel.

Rowe (1996) describes bank effect.

"When a ship is making headway, a positive pressure area builds up forward of the pivot point, whilst aft of the pivot point the flow of water down the ship's side creates a low pressure area. This area extends out from the ship and in deep, open water, clear of other traffic, is not a problem.

If however the ship commences to close a vertical obstruction, such as a shoal or canal bank, the area experiences some degree of restriction and the ship will be influenced by the resultant forces which build up. It is often thought that the positive pressure at the bow is the main problem, probably because of the tendency to relate most channel work to the bow and heading. . . . whilst the pressure at the bow is important, it is only working on a short turning lever forward of the pivot point. The low pressure or suction area is, on the other hand, working well aft of the pivot point and consequently is a very strong force.

As a result of these two forces which have developed, the stern of the ship is likely to be sucked into the bank. It can be very difficult to break out of its hold, the ship requiring constant corrective rudder and power, sometimes hard over, in order to control heading." [1]

Squat refers to the tendency of a ship to sink lower in the water and change trim. Squat is a function of the ship's shape and speed through the water. The effects of squat are further accentuated in shallow water (less than twice the draught), where the water passing under the ship is restricted. The water passing under the bow accelerates creating a low pressure. Also, there is a build up of water ahead of the ship increasing resistance to the ship's passage, which displaces the pivot point* to a position closer to amidships. This in turn reduces the lever effect of the rudder and a ship's ability to steer accurately.

In confined waters at nine knots, *Fitzroy River,* with a block coefficient** of 0.85 may experience a sinkage at the bow of 1.2 m. In Weipa, the minimum operating underkeel clearance is set at 0.9 m. Either vessels in Weipa do not squat to the full extent, or "insurance" dredging to depths greater than shown as chart datum, account for vessels not taking the ground between Bn.30 and Bn.20 or in South Channel.

---

[1] Rowe,R.W. The Shiphandler's Guide, London, The Nautical Institute, 1996

* Pivot point is the point about which a ship will turn. When stopped, the pivot point coincides with the ship's centre of gravity (usually about amidships). As a rule of thumb, when making headway at a constant speed the pivot point is about 25 per cent of the ship's length measured from the bow. Conversely, when making sternway the pivot point is about 25 percent of the ship's length from the stern.

Tidal flow

The Master stated that he made due allowance for the anticipated southerly set of the tide, but there seemed to be less set than he anticipated. He attributed the grounding to this cause. He provided a comparison of predicted and actual tidal times and heights, as recorded by the Queensland Department of Transport, for the period 0000, 23 August 1998 to 2400, 25 August 1998.

With the exception of the evening tide of 24 August, the height of the recorded high and low tide waters were above prediction. This resulted in a range of tide marginally greater than predicted. The rate of tidal flow is usually a function of the range of tide and on those tides there may have been a slight increase in the rate of the tidal stream.

A study of the Weipa tides (Ring, 1994) showed that the actual tides in Weipa harbour can vary by 0.4 m. The study makes the following observations of the "dry" season tidal variations.

"With the on-set of south easterly weather the actual tide heights fail to reach the predicted levels. Generally 30 to 36 hours after the wind has increased to a steady velocity, around 20 knots, the actual tide heights are about 25 to 30 centimetres down on prediction.

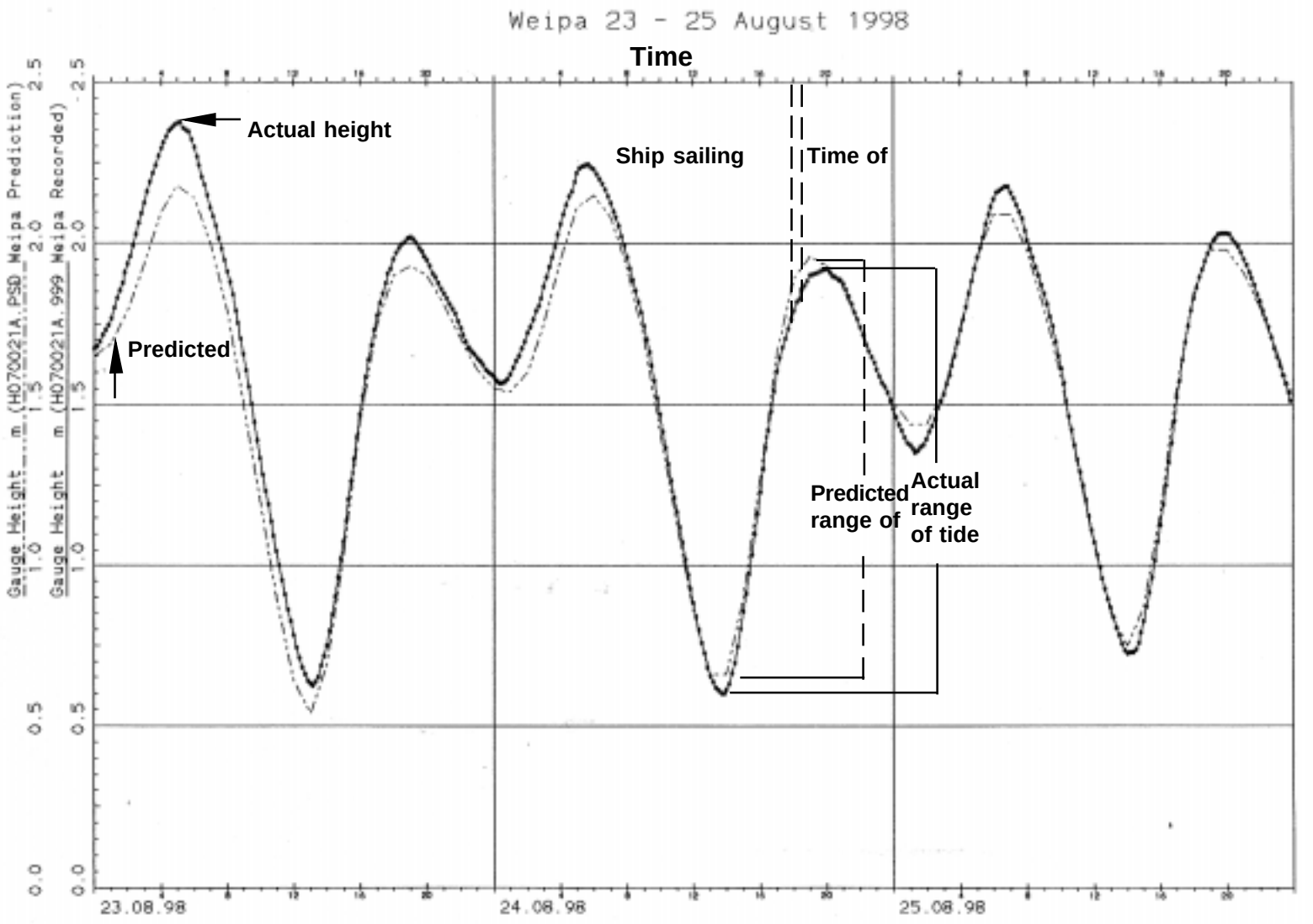
For the duration of the south easterly weather, if the velocity of the wind remains reasonably steady then the difference in height of actual and predicted tides remains constant. The build up in deviation (tide height) occurred at a similar rate to the increase in wind strength, however, at the end of the south easterly the tides take three days to return to predicted levels whereas the wind eased from maximum strength to insignificant levels in a matter of hours." [2]

Meteorological Observations at Weipa Airport (3.2 miles from Lorim Point) for the month of August show a typical "dry season" pattern with winds predominantly between east and south-east seldom exceeding 15 knots. There were some occasions when there was no wind, or there were limited periods of westerly winds; no rain was recorded in August. There was a period on 17 and 18 August of both variable winds and calm periods.

---

[2] Ring, G. Weipa Tidal Study, Queensland Transport, 1994

[**] Block Coefficient : The factor relating the volume of a ship's hull to that of a box of the same overall dimensions.



Weipa tidal gauge recorder trace
23 August - 25 August 1998

From 19 August to 24 August, over 44 observations, the winds were consistently from between east and south-east averaging 22 km/h (11.8 knots). The modal wind speed was between 13 knots and 15 knots. The maximum wind speed recorded in the six day period was 37 km/h (20 knots) at 1200 on 24 August. The average barometric pressure over the period was 1012.25 hPa with a minimum of 1009.1 hPa and a maximum pressure of 1014.7 hPa. In the 36 hours before *Fitzroy River* sailed, the average wind speed was 12.5 knots.

The meteorological conditions over the preceding days would not, in all probability, have had any significant effect on the rate of tidal flow.

On the evening tide of 24 August with high water predicted at 1910, the tide did not make the predicted height, falling 5 cm short. The range of tide, at 1.3 m was as predicted.

The maximum flow is on the ebb tide with the stream of the Embley River. Rates of 4 to 4.5 knots are experienced on the ebb tide, the maximum rate being anticipated three hours after high water; these rates will vary depending upon the season and the volume of water discharging from the river. On the flood tides, tidal streams follow the line of the river and rates of flow will vary depending on the season and the range of tide. Estimates of the maximum tidal flow one hour before high water, by pilots past and present, vary from 1 knot to as much as four knots.

Since 1980, the Queensland Department of Transport has conducted four investigations of tidal streams in the Bellmouth and adjacent areas:

- 30 May to 10 June 1980;
- 1 June to 3 June 1985;
- 10 August to 11 August 1990;
- 3 August 1991.

The 1980 study of 12 days involved a maximum range of tide of 1.9 m and centred on the tidal stream 1 hour before high water. The tidal stream followed the alignment of the channel and achieved a maximum

rate of 0.9 knots.

The 1985 study over a three day period involved a maximum range of 2.09 m. The tidal rates were recorded at all states of the tide having a maximum 3.4 knots on the ebb and 1.9 knots on the flood. The direction of the current was consistent with the 1980 study.

The 1990 study involved a tidal range of 1.46 m and was more extensive in area, covering the channel north of Cora Bank to Lorim Point. Tidal streams were observed for 1 hour before high water, giving a tidal stream of 1.2 to 1.8 knots; 30 minutes before high water with a tidal stream of 0.6 to 1.4 knots; and at high water, a rate of 0.6 to 1 knot.

The 1991 study, when the tidal range was 0.95 m. recorded a maximum rate 1 hour before high water of 2.0 knots, 30 minutes before high water of 1.2 knots and at high water of 0.6 knots.

In all the studies the direction of the tidal streams were consistent. From Lorim Point to Evans Landing the current follows the line of the channel and has minimal lateral effect on the ship's passage. Between Evans Landing and Gonbung Point the 1990 study showed a set northwards towards the shore.

In the Embley River, the direction of tidal flow is about 115° toward the mid-point and about 080° between Bn.17 and Bn.18. A ship steering 280° would have the tidal stream 15° on the starboard bow. The maximum effect would be on a ship steering about 250° before entering south channel when the tide would be about 45° on the bow.

The distance between Bn.20 and Bn.18 is about 1200 m. A ship on a direct course between the two beacons travelling at nine knots takes 4.3 minutes to cross the Embley River to the Bellmouth. Given the vectors involved, with a tidal stream of 1.5 knots, the maximum southerly set would be in the region of 100 m; for a one knot tide, 75 m.

Based on the advice of a number of pilots with experience in Weipa, it is unlikely that a ship sailing one and a quarter hours before high water and arriving in the Bellmouth 45 minutes before high water will experience more than 1 knot of current. It was also stressed that the rate of tidal flow was unpredictable, sometimes being less than anticipated and sometimes more.

Pilotage training and guidelines

For a master to gain pilotage exemption he/she is required to complete a minimum of six inward passages and six outward passages observing a licensed pilot, in any period of 12 consecutive months. To qualify for night navigation at least one inward and one outward passage must be completed. Once a master is confident to apply for an exemption certificate, an oral and written exam is conducted on port procedures and, if successful, a Provisional Pilotage Exemption Certificate is issued. A master must pilot the ship on two further passages inward and outward with a pilot observing and assessing the master. Providing the pilot's assessment is favourable, a Pilotage Exemption Certificate will be issued for the class of ship on which the qualifying voyages were made.

While the rules for obtaining a pilotage exemption and the Weipa Port Procedures are clear, the actual transfer of knowledge of the tides, depths and pilotage techniques seems somewhat ad hoc.

Harbour Masters responsible for the port of Weipa have investigated individual incidents over the years. However, no reference is made to these in pilot training and no analysis of any accident is available for masters seeking exemption. Similarly Australian shipping companies have not provided their exempt masters with analyses of groundings involving their ships, four of which have occurred since 1988. Three of these four groundings have been strikingly similar to the incident of 24 August and involved touching or grounding on the bank extending from Bn.18. It is important to learn the lessons that such incidents provide to enhance the knowledge of pilots and exempt masters alike, either by access to the port authorities reports or the ship managers' analyses.

The Master, at interview and in subsequent submission, stated that he had not been shown, and did not know of, the tidal studies undertaken by the Queensland Marine Authorities, although they were available at the pilot office in Weipa.

Although individual pilots often have their own preferred pilotage plans and techniques, given the constraints of channels and tides, individual variations are usually in the fine detail. For ships sailing from Weipa the general directions that pilots follow are relatively consistent from pilot to pilot.

"After sailing from Lorim Point ships are recommended to maintain a position slightly favouring the north side of the channel heading towards the oil tanks at Evans Landing. Speed should be increased steadily. When Bn.36 is abeam of the bridge the ship should be brought round slowly in mid channel keeping well clear of Bn.29 and more than 30 m off Bn.27. The ship should then be steadied on Cora Bank West beacon on a heading of about 236°. To maintain the heading considerable port rudder may have to be carried to counteract a tidal stream, which sets to the north between Bn.30 and Bn.32. The amount of port rudder carried between these beacons is an indication of the strength of the tidal stream in the Bellmouth and what helm will be needed in the Bellmouth.

When Bn.28 is about 45° on the starboard bow the rudder should be put amidships and the bow allowed to pay off to starboard. Once clear of Bn.28, rudder should be used to come to a heading of 275° or 280°. Ships should pass close to Bn.20 and, when it is abaft the beam and the ship is past the transit of the South Channel green beacons, the ship should be allowed to come slowly to port to swing into the channel. The amount of helm required will depend upon the strength of the tide in the Bellmouth. The flood tide sets strongly to the south-east and will set the ship bodily down onto Urquhart Point. The ship should be moving at a reasonable speed. The aim is to enter the channel to the north of the centre line transit (078°/258°) on a course of 252° to 255° heading for Bn.15, before steadying the ship on the centre line." [3]

Such guidelines provide sound advice. But, as with any pilotage, a pilot must have sufficient local knowledge to make the necessary adjustments when faced with varying conditions of tide, weather and ship handling characteristics.

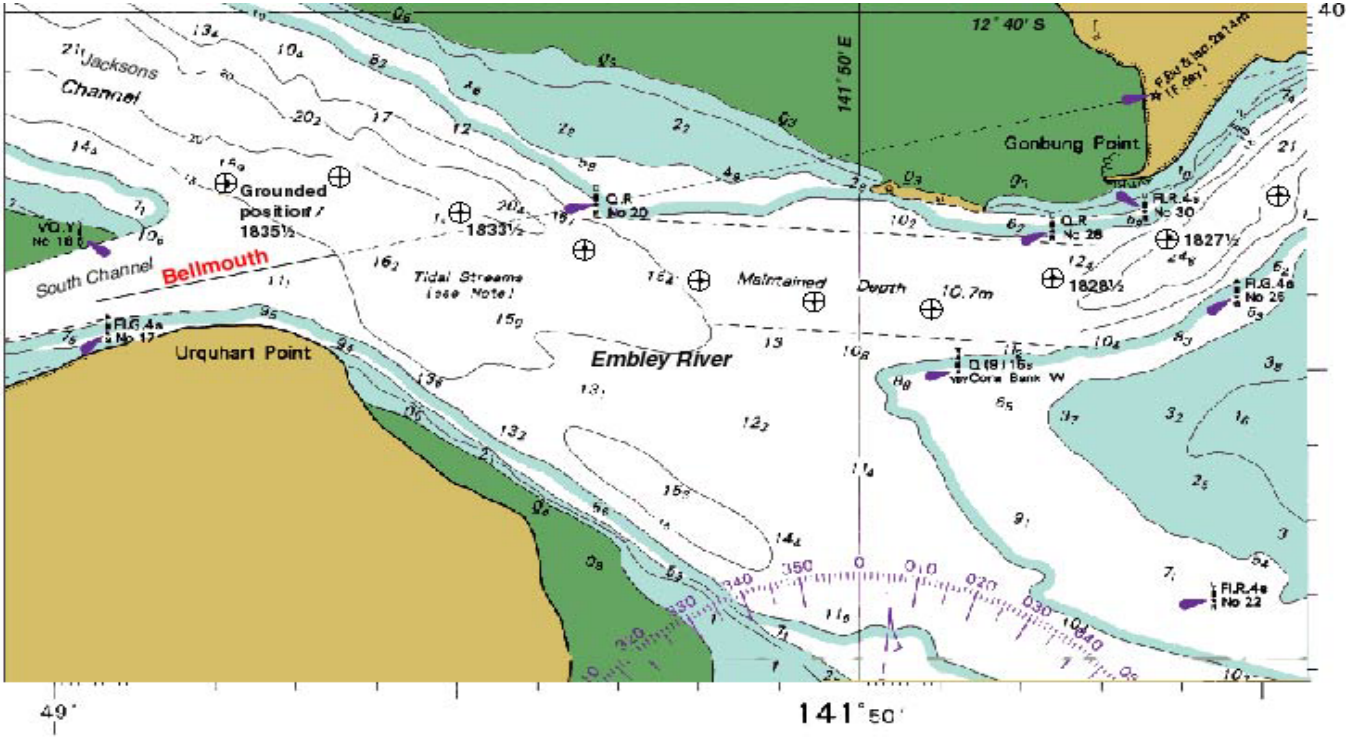
The grounding

Fitzroy River 24 August

At interview the Master stated that he had planned to follow the normal pilotage manoeuvre and position *Fitzroy River* in the "Bellmouth" so that the ship was well north of the South Channel centre line leading

---

[3] The pilotage description is taken from notes by Captain M Lutz and Captain E M Cain, and advice given by Captain A Lawson, who invited the Investigator to observe an outward pilotage.



Portion of Chart Aus4 showing positions 1826 - 1836 on 24 August taken from GPS plotter

lights. The Master anticipated that the last of the flood tide would set the ship to the south and assist aligning the ship in the channel.

The following reconstruction of the ship's outward passage is based on various documents including GPS plot, the course recorder chart, the echo sounder trace and the ship's bell book.

On 24 August sunset was at 1829 and civil twilight at 1850. *Fitzroy River* sailed about 30 minutes before sunset. At 1800 on 24 August the wind speed at the airport was recorded at 26 km/h (14 knots) from the east-south-east and the barometric pressure was 1012.0 hPa. Visibility was good and there was sufficient daylight at 1830 to see three or more sets of beacons from the bridge. As the sun set a band of cloud, low on the horizon obscured the sun and there was minimal glare.

From Lorim Point the outward pilotage proceeded routinely and speed was increased steadily. From 1820 to 1823:40 *Fitzroy River* was slightly to the south of the channel between Bn.36 and Bn.32, turning under about 15° of port rudder at a rate of about 7.5°/min. At 1825, approaching Bn.27, *Fitzroy River* steadied on a course of 246° and was making about eight knots over the ground. From the berth to this point the underkeel clearance was in the region of 2.7 m except a momentary minimum of 2.2 m, probably in the area of Bn.27. The ship, which was designed with a large rudder specifically fitted to assist manoeuvring in waters confined laterally and by depth, steered well.

At 1825, the rudder was initially put amidships and then about 10° port helm followed by 15° port helm was carried for about one minute. At 1826, when passing Bn.27, the rudder was put amidships and the ship maintained its general course for about one minute without any marked movement to starboard. At 1826:30 with Bn.30 about 45° on the starboard bow about 15° of starboard rudder was applied.

These rudder movements and the steady heading on 246° would suggest that the northerly set between Bn.30 and Bn.32 may not have been as strong as sometimes experienced.

At 1827 the ship entered relatively deep water (>2 times the draught) for about one minute before reaching the area of minimum depth between Bn.28 and Bn.20, where the under keel clearance reduced rapidly to 0.8 m. This rapid shelving or "step" would cause extra sinkage, reducing rudder response.

At 1827:30 the ship was ideally positioned when passing about 50 m off Bn.30 and approaching Bn.28 on a heading of about 248°, turning to starboard at a rate of 19 °/min under full starboard rudder. At 1828:30, when passing Bn.28, the rudder angle was eased and at 1829 the rudder was placed amidships. With the rudder amidships for about 90 seconds the ship continued to turn to starboard at a reduced rate of about 7°/min. At 1830:30 the ship's heading was 281°, turning at about 4°/min, reaching a heading of 285° at 1831:30.

From about 1828 to 1832 the vessel was in the area of channel maintained at 10.7 m. Shallow water has a marked effect on a ship's ability to turn under helm producing a smaller yaw angle than in deep water. A "rule of thumb" is that with an underkeel clearance (UKC) of 0.4 times the draught, the diameter of a ship's turning circle can double. (Paffett, 1990)[4] (Rowe, 1996)

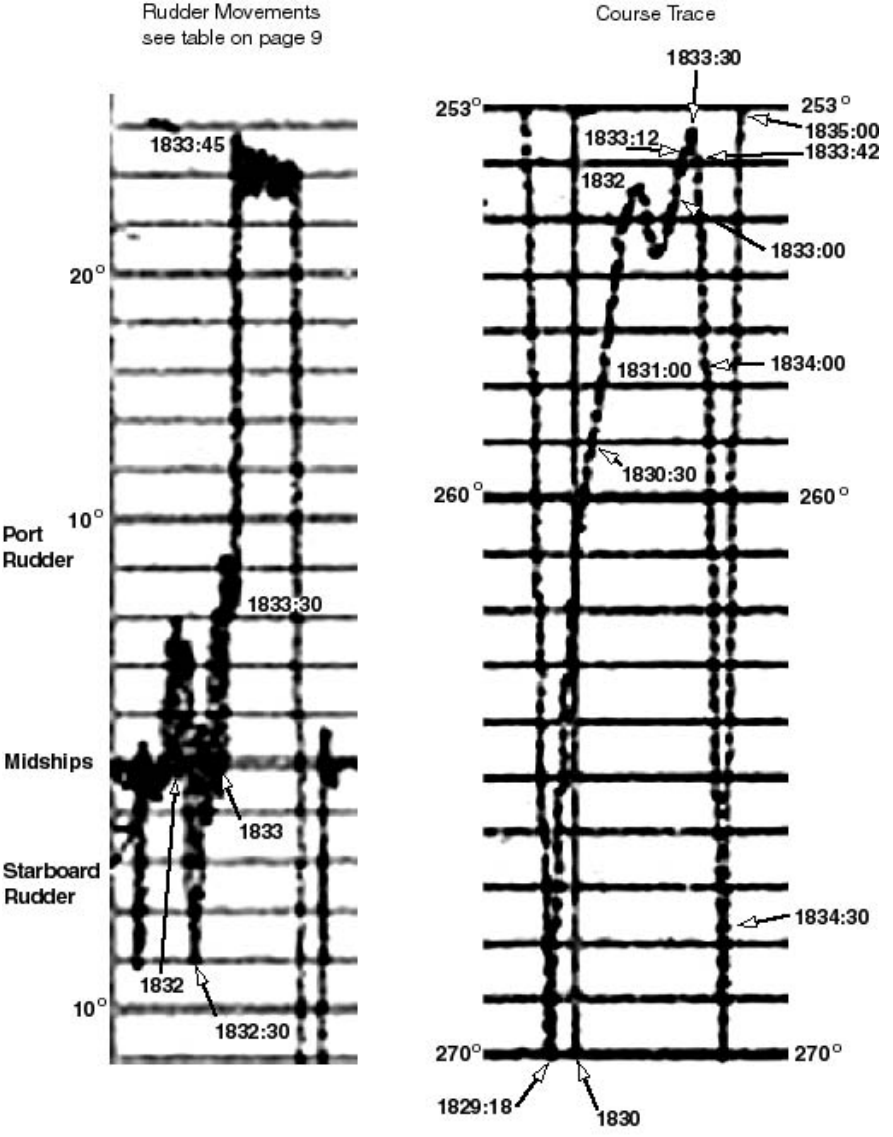
It was between Bn.28 and Bn.20 that the Master went to the starboard bridge wing to check the transit of Bn.25 and Bn.33. He was unable to see the rear beacon (Bn. 33) and went back into the wheelhouse and asked the Mate whether or not he could see the beacons. The Mate went to the starboard bridge wing and stood, with the Master behind him, looking aft. Bn.33 did not readily stand-out and both men returned to the wheelhouse. From the time that the Master went to the bridge wing to the time that both the Master and Mate returned to the bridge could have taken anything from 20 seconds to nearly one minute. The Master realised that, although the ship was in safe water, the ship was to the south of his preferred position and ordered a course of 285° to correct for the southerly position and in anticipation of the tide setting the ship to the south in the Bellmouth.

A probable explanation of the ship's position to the south of the channel, towards Cora Bank beacon, is that the starboard rudder was removed too early. This loss of rudder turning force, coupled with the sudden reduction in depth increased the diameter of the ship's turn.

At about 1831:45 the ship reached a heading of 285° and the rudder was put amidships. At 1832 the ship's head started to move to port and the helmsman applied about 10° of starboard rudder to check the swing.

---

[4] Paffett, J.A.H. Turning Corners and Manoeuvring – The Forces on a Ship, The Nautical Institute on Pilotage and shiphandling, 1990



Enlargement of course recorder trace 1829 - 1835

At this time the minimum UKC increased from 0.8 m to about 10.0 m, which should have improved the steering characteristics.

At about 1833 the ship's bridge was abeam of, and about 70 m from, Bn.20. The ship's speed was marginally more than 9 knots (280 m/min) and the ship's head, at about 285°, was slowly moving to starboard. The Master gave the order for 15° port rudder. With 15° port rudder applied the swing to starboard was checked at a heading of 286½° at 1833:30 as the ship crossed the centre line transit of South Channel about 150 m from Bn.20; at this time full port rudder was applied. About 12 seconds later the ship's head passed through 285° turning to port. The reality, therefore, was the turn to port was delayed by some 45 seconds in which time *Fitzroy River* advanced some 210 m.

Once established, the turn to port accelerated rapidly and between 1834 and 1835, the rate of turn was 29°/min. The ship's speed of more than 4.7 m/sec or 280 m/min, meant that between 1833:30 and 1835:30 the ship advanced a distance of at least 560 m.

Fitzroy River stopped its swing at about 1835:30, at which time the ship was felt to ground, with the ship heading 240°. The engine telegraph was put to 70 rpm astern, the rudder was put amidships and full starboard rudder applied briefly. The ship remained aground.

In the Inspector's opinion, between 1826 and 1833, the Master made a number of minor errors of judgement. These compounded into a situation that resulted in the grounding.

- Between 1826 and 1828 it is probable that he overlooked one possible indicator of the strength of tide in the Embley River when the ship did not carry consistent port helm between Bn.30 and Bn.32.
- At 1828, with the ship in a good position off Bn.28 the rudder was centred and the effects of the minimal underkeel clearance reduced the ship's rate of turn to starboard.
- The choice of the stern transit, which amongst other factors was hard to see, meant that the Master was distracted for some vital seconds before realising that the ship was too far towards the southern side of the channel.

- When the Master did order port rudder, he did not realise that the helmsman had just corrected the ship's head and there was a turning motion to starboard which had to be counteracted before the turn to port started.

These factors combined, so that when the ship first began to turn to port, *Fitzroy River's* bridge was about 150 m (ship's stem 360 m) from Bn.20.

There is no criticism of the Helmsman, he was merely maintaining the ship on course, within one to two degrees of the ordered course. Both the Master and Mate stated that the Helmsman steered the ship as required.

Master's Experience

The Master had first been appointed to command in August 1993. *Fitzroy River* was the sixth vessel on which he had sailed as Master.

All previous five ships were motor vessels. Three ships were twin screw roll-on/roll-off cargo vessels of less than 10,000 tonnes deadweight; one a single screw container ship of 8,450 tonnes deadweight; and one a single screw general cargo vessel of 14,205 tonnes deadweight. These five ships had a power (kW) to deadweight ratio of better than 1: 1.8.

In these various ships the Master had acquired, and regularly used, pilotage exemption certificates. Before being appointed to *Fitzroy River* he held pilotage exemption for ten ports, five in Australia and five in New Zealand.

Fitzroy River was his first command of a steam turbine vessel. On such vessels changes of speed are slower than for the equivalent marine diesel engine. Also *Fitzroy River* was a considerably bigger ship in terms of deadweight, length and beam and also having a deeper loaded draught. The ratio of power to deadweight, at 1:5.4, was also significantly smaller.

After joining *Fitzroy River* in February 1997 he was required to take a pilot when arriving and sailing from both Gladstone and Weipa. On 21 January 1998 he was granted a pilotage exemption for Gladstone, and

on 20 February 1998 he was granted exemption for Weipa.

Since obtaining his Weipa pilotage exemption he had completed six voyages in and out of Weipa; the incident of the 24 August occurred on his seventh voyage as an exempted master. Although experienced in ship handling in general, his experience of *Fitzroy River* and Weipa pilotage was limited.

Bridge organisation

The passage plan lacked many elements recommended by the 3rd Edition of the Bridge Procedures Guide, issued by the International Chamber of Shipping. The ICS Bridge Procedures Guide specifically recommends at 2.6.1 that:

"A plan should still be prepared even if the master of the ship has a Pilotage Exemption Certificate for the port."

Although not extensive, the Master did have a plan. Before sailing the Master told the Mate that, after rounding Gonbung Point, he would use the transit of Bn.25 with Bn.33 to monitor the ship's position in the channel between Bn.28 and Bn.20 and asked the Mate to "keep an eye" on this transit.

The Inspector finds the practical logic in this plan hard to understand. Bn.33 would have been about 1.4 miles away when *Fitzroy River* passed Bn.28 and difficult to pick out against the background of Lorim Point. Also, the view astern of *Fitzroy River* is severely restricted by the ship's funnel and engine casing and the only view astern is from the bridge wings. In addition the ship was being conned from the centre line and starboard side of the wheelhouse, while both Bn.25 and Bn.33 were to the port side. The Mate was monitoring the ship's position, the helmsman and responding to engine orders at the control console on the starboard side of the wheelhouse. Given the ship's beam of over 35 m, there were insufficient personnel on the bridge to effectively monitor this part of the Master's plan.

In Weipa in clear weather, the use of transit marks astern of the ship is also questionable given the cues and prompts provided by the South Channel Beacons. Between Evans Landing and approaching Gonbung Point, outward bound, both the green (starboard) and red (port) beacons are visible. As a ship approaches

Gonbung Point, Urquhart Point shuts out the starboard hand beacons, but Bn.18 and the port side beacons remain visible. The general pilotage advice is for ships to pass close to Bn.28 and Bn.20, the tidal stream tending to set ships to the south and there is deep water right up to Bn.20. The reappearance of the South Channel starboard hand beacons, midway between Bn.28 and Bn.20 and the alignment of the port and starboard beacons provide practical cues to turn the ship to port into South Channel.

The ship did not routinely use radar techniques such as parallel indexing. With only the Master, Mate and Helmsman on the bridge, there were not enough qualified personnel to effectively monitor the ship's position, move the engine control, maintain the bell book and monitor the ship by parallel indexing. Such a technique, properly implemented, would have warned the Master that the ship was likely to be out of position when in the vicinity of Bn.20.

The ship also had a computer generated chart that could be overlaid on the radar screen. There were difficulties in stabilising the chart so that it would be sufficiently accurate for fine navigation. Again however, there were insufficient qualified personnel on the bridge to make effective use of the system.

Fatigue

There is no evidence that either the Master or the IR on watch were affected by fatigue. The evidence is that the Master took normal exercise on the preceding day and slept normally.

The Mate had been up since about 0230 that morning and, after some sixteen hours, he must have been feeling somewhat tired. Often such people do not realise they are fatigued, but their performance is diminished. Although not critical to the event, tiredness may have accounted for him entering a time of 1819 on the chart for passing Bn.36 instead of Bn38, as correctly entered in the "bell book".

The ship maintains a record of hours worked by each watchkeeper on board, in accordance with Marine Orders Part 28.4.6. These records indicated that all hours were within the requirements of the Seafarers' Training, Certification and Watchkeeping Code. The IR acting as Quartermaster, had not kept any record of his hours, but he stated that he maintained his normal routine and that he was not fatigued.

Alcohol and Drugs

At about midnight, after the immediate attempt to refloat the ship had been suspended, the Master and Mate went to the Master's cabin to undertake a "breathalyser" test. The batteries in the evidentiary breathalyser were exhausted and the Second Mate witnessed this. It was also found that the batteries for the alternative breathalyser were also flat. No objective evidence is available that alcohol was either absent or involved.

However, given all the evidence available, the Inspector is satisfied that neither drugs nor alcohol were involved in this incident.

Training

In submission both the Queensland Department of Transport and ASP Ship Management recognised the need to review pilot training and the information supplied.

Conclusions

These conclusions identify the different factors contributing to the incident and should not be read as apportioning blame or liability to any particular organisation or individual.

The following factors are considered to have contributed to the grounding:

1. The intended use of Bn.25 and Bn.33 in transit was inappropriate and impracticable given that:
   - they were astern of the ship;
   - *Fitzroy River* has limited visibility astern;
   - Bn.33 would be over 1.4 miles away and difficult to see;
   - there were insufficient people on the bridge to monitor the transit from the port side of the ship;
   - there were adequate cues and prompts for conning *Fitzroy River* ahead of the ship; and
   - looking for the transit was a distraction.
2. Reduced underkeel clearance affected the rate of turn between Bn.28 and Bn.20.
3. Given *Fitzroy River's* distance from Bn.20 and the ship's heading when the Master ordered the rudder to port to turn into South Channel, the order was given too late.
4. At the time of the order to put the rudder to port, there was a residual swing to starboard, which built in a critical delay in the turn.
5. The Master's relative inexperience resulted in his not detecting a reduced set to the north between Bn.30 and Bn.32, which should have alerted him to a possibly reduced tidal flow in the Embley River.
6. Although there is some evidence of a slightly reduced tidal flow in the Embley River, it was the series of small errors of judgement, rather than the reduced rate of the tidal stream that were the main contributors to the grounding.

7. The reduced manning on the bridge did not allow for full use to be made of the electronic navigation aids, particularly the radars.

8. Deficiencies in the training of exempt masters.

   • Written advice to masters seeking exemption is based on notes made by past pilots. These notes have no official standing and do not include tidal data provided to the port authority.

   • The ad hoc nature in the training of exempt Masters for the Port of Weipa, resulted in a lack of structure in training and the Master not receiving critical information.

9. Although a number of bulk carriers at maximum draught have grounded on the outward passage in the port of Weipa, none of the reports are made available to masters seeking pilotage exemption and no overall analysis is available from which lessons can be learnt.

It is further considered that:

10. The Helmsman steered the ship proficiently, in accordance with the Master's orders.

11. After the grounding, the Master and crew followed all the correct procedures. These actions, combined with the ASP Ship Management Emergency Plan and the operation of the tugs, contributed to the safe refloating of the ship.

Submissions

Under sub-regulation 16(3) of the Navigation (Marine Casualty) Regulations, if a report, or part of a report, relates to a person's affairs to a material extent, the Inspector must, if it is reasonable to do so, give that person a copy of the report or the relevant part of the report. Sub-regulation 16(4) provides that such a person may provide written comments or information relating to the report.

The final draft of the report, or relevant parts thereof, was sent to the Master, ASP Ship Management, Queensland Department of Transport and Queensland Ports Corporation.

The Master submitted:

I submit that if I am to be justly accused of errors of judgement then the information & training that I have at my disposal to make those judgements should be of the fullest.

In light of the above please consider the following:

A)The incident: Conclusions

1) Point 1. I disagree with the point that there are adequate cues & prompts ahead of the vessel outbound, to ignore these leads. These leads are of interest to establish the vessels position, North or South, of the centreline of the dredged channel south of Gonbung point, after making the turn at Bcn No 28. There is nothing ahead of the vessel that readily provides this information, at the completion of this turn. If these lights astern were brighter, then they would be more easily identified and readily useable for quickly establishing the v/ls position N or S in this area. I take your point that parallel indexing here off Bcns 28/20 would be of benefit.

2) Point 2. I agree that the UKC between 28 & 20 was reduced to the minimum allowed for the port; this in turn reduced the vessels rate of turn, but this was not readily apparent at the time if the incident. I point out that the vessel is not fitted with a rate of turn indicator.

3) Point 3 & 6. I am criticised for applying helm too late in making the turn into the bellmouth. I re-submit

that if the tide was strongly setting to the south east as I had been led to believe from previous training and the port pilotage notes then the turn would have been satisfactorily completed. I was trained to expect, strong SE sets in this area and applied helm accordingly. A waverider buoy, established in this area to provide current tidal strength information, would be most advantageous.

4) Point 5. I am criticised for not appreciating that a reduced set to the north between Bn 30 & Bn 32. did not alert me to the possibility of a reduced set in the Bellmouth. This error was put down to the need for less rudder in this area to maintain the vessels swing. On the night in question in this area I used, by the reports' evaluation, first port 10 then port 15 degrees of rudder. The range of tide was 1.3m.

An examination of 3 other departure pilotages reveals that in the same area a similar amount of helm is used here regardless of tidal range. How then can helm amount, applied in this area, be an objective guide to set in the Bellmouth as the pilotage notes expound? I believe that helm applied in this area is not indicative of set to be experienced later in the Bellmouth, and the pilotage notes are in error on this point.

B) Training

1) The report says" Pilotage, which is exacting, is compulsory. Anticipating the current and correctly positioning the vessel is critical." Clearly this is the case as the report says at one point "Estimates of the maximum tidal flow one hour before high water, by pilots past and present, vary from 1 knot to as much as four knots" and later "Based on the advice of a number of pilots with experience in Weipa, it is unlikely that a ship sailing one and a quarter hours before high water and arriving in the Bellmouth 45 minutes before high water will experience more than one knot of current." Clearly anticipating the current is vital if the set can vary by as much as 3 knots in 30 minutes!! It was in this vein and variance of opinion that I was trained and not in the light of the of the surveys you quote.

The tidal survey information you refer too in your report was not known to me at the time of the incident. Indeed when other exempt masters & pilots were asked if they had knowledge of their existence they all said they did not. I consider these surveys critical to the preparation of candidates for exemptions & pilotage licences and ask why their existence is not brought to the attention of such candidates. Indeed, the written examination paper for the Weipa exemption does not even ask the question of how a master

proposes to execute a departure from Weipa; let alone if he is aware that these surveys exist!!

2) I was trained, as per the Port Pilotage notes, to expect strong SE sets in the area of the Bellmouth. Further, the report, while endorsing that strong sets exist in the Bellmouth, dismisses the contention that anticipating the effects of these same sets is immaterial to the incident when they are absent; when there is no evidence to indicate this absence. If it is suggested that this should have been expected by saying that recent weather had a 'flattening effect' on this tide I would point out that the tides immediately preceding the incident were above prediction and range.

3) A previous grounding incident (Oct'96) which was not investigated by MIIU, was of a similar nature as the one in question. Surely, if this earlier incident had been subject to the same scrutiny as that above, then salient factors and errors in training and port notes would have been brought to light and the above incident may have been avoided. I suggest therefore that this investigation could have gone further in considering wider influences, other than ship operations, that I believe are material, and contributed to the incident."

The Executive Director (Maritime), Queensland Transport, in a letter dated 26 February 1999, referring to the grounding of the Fitzroy River at Weipa, made the following submission:

(The dredging of the Bellmouth) was undertaken as a result of frequent groundings in the entrance. Its results were immediately apparent with grounding incidents being almost eliminated.

The major cause of these groundings was that as a ship entered the bellmouth it was trying to steady after an alteration to port, i.e. it had starboard helm on. On entering it would then encounter bank effect from Urquhart Point and the flood tide pushing its stern to port. These two effects, if not countered rapidly would combine to put the ship aground on the north side of the channel near beacon 15. The belling out of the entrance gave more manoeuvring room and largely eliminated the problem.

The reference to deficiencies in the training of exempt masters contained in the Conclusions of the Report is noted. By its nature this training is received very much by looking over the shoulder of a working pilot. So, much of the transfer of information is oral. The need to develop a more formal reference source of information has been recognised. The first step has been the development of a Port Operations Manual for each port. The next step is the development of a training manual for pilots and exempt masters, which will collect together the information needed to ensure that in-depth information about the port is available to the trainee."

Details of Fitzroy River

Previous name	TNT Capricornia
IMO Number	8019019
Flag	Australian
Classification Society	Lloyd’s Register of Shipping
Ship Type	Bulk
Builder	Italcantieri S.p.A, Monfalcone, Italy
Year Built	1983
Owner	Hull 4382 Leasing Pty Ltd
Ship Managers	ASP Ship Management
Gross Tonnage	50,144
Net Tonnage	15,043
Summer deadweight	75,105 tonnes
Summer draught	12.224 m
Length overall	255 m
Breadth	35.36 m
Moulded depth	19.0 m
Engine	General Electric Steam Turbines
Power	13,738 kW
Crew	21