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PROFESSIONAL *Skipper*

MAY/JUNE 2020

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**new survey
flagship**



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ISSUE 135



TUPAIA

NEW SURVEY FLAGSHIP

BY KEITH INGRAM



This new specialist hydrographic survey craft – built by Senator Boats in Napier – has just entered service with one of New Zealand’s leading hydrographic surveying companies, Discovery Marine Ltd. She is aptly named *Tupaia* after the legendary Tahitian Polynesian navigator, who was originally from the island of Ra’iatea in the Pacific Islands group known (to Europeans) as the Society Islands.

The vessel’s name follows the owner’s practice and philosophy: to choose as names either historical coast survey vessel names or those of well-known navigators or explorers. Tupaia was of course the famous Tahitian navigator and priest who sailed with Captain James Cook in *Endeavour* as a guide and interpreter on its first voyage of exploration to New Zealand and Australia.

There’s a one-liner that’s often used within the senior team at Discovery Marine when presenting their justification for the next new vessel acquisition: “It’s hard to find the perfect vessel!” But according to Greg Cox, DML’s Operations Manager and Company Director, their latest acquisition, this 7.7m Senator, with custom features, comes *very close*.

Discovery Marine is a specialist hydrographic surveying company which collects and analyses bathymetry using sophisticated echo sounders and marine sensors. This data

collected is used to create nautical charts for safe ship navigation; to assist coastal scientists in understanding erosion and marine habitats; and to enable pilots to guide ships safely within ports.

The company also deploys mobile laser scanners on vessels to provide their clients with seamless data from both above and below the water. This is invaluable for modelling things like water volumes within dams and reservoirs, and for assessing the integrity of near-water infrastructure (such as bridges and wharves).

This type of work is largely undertaken in what the industry terms the ‘shallow water’ – the zone between the drying line around New Zealand’s coastline and extending out to the 50m depth contour. DML is one of two specialist hydrographic survey providers to Land Information New Zealand in support of national nautical charting requirements. Only recently, they were also appointed to a panel of providers to the Australian Government – although this opportunity is on hold for now, while the world tries to contain COVID-19.

Mariners and seafarers of all descriptions need confidence that the charts they are relying on will alert them to any navigational hazards, highlight safe passages, and identify safe anchorages should they need them. To enable this, hydrographic surveyors, essentially, go looking for rocks and hazards.

It’s easy to appreciate that this type of work presents an operational risk and occupational hazards. When working around New Zealand’s coastline, teams will encounter rocky outcrops, sudden changes in uncharted depths, large swells and surge, strong tidal currents, as well as rapid changes in sea-state and weather conditions.

Having a reliable, safe, sturdy and comfortable vessel isn't just a nice-to-have, it's an absolute necessity.

If one was to study any chart they should not be surprised to find many isolated rocks or reefs named after former hydrographic survey vessels. It was then the tradition whenever the Royal Navy's, and later, the Royal New Zealand Navy's hydrographic survey vessels discovered an uncharted rock or reef "the hard way", to name the newly-found hazard to navigation after the vessel which had the first close encounter.

For instance, the popular fishing spot on 'Takapu Rock' near the Noises in the Hauraki Gulf is one such discovery made when I was serving as Cox'n on the survey motor launch HMNZS *Takapu*. Clearly then, and now, close encounters with 'terra-firma' remain an occupational hazard for our hydrographic surveyors.



Taniwha with the side mounted MRES

FLEET

Discovery Marine owns and operates a small fleet of five vessels – ranging in size from 4m to 8m. Each vessel has unique characteristics enabling the company to tackle a wide variety of challenging surveys within the inland and inshore environments – from river surveys to harbour and coastal charting surveys. A total of four staff hold relevant tickets to operate the vessels. For larger offshore projects, DML charts commercial work vessels, and equipment is fitted to these vessels as and when required.

For the last couple of years, DML's 8m Senator *Taniwha* has been the main workhorse for harbour and LINZ charting surveys. She was purchased second-hand and converted for survey use. However the layout has not always been perfect. She is an open hard top, and a large amount of electronics are being used on the boat. Therefore, the decision was made to replace *Taniwha* with a similar hull – but with an enclosed cabin.

The decision to approach Senator Boats to build a new boat was an easy one. DML has owned two other Senator boats in the past. Senator build strong hulls, and the Pontoon RH series are great sea-keeping hulls that can cope with typical New Zealand coastal conditions.

Unlike a number of other boat builders, Senator is more than happy to modify their standard hulls to accommodate a client's special requirements. "In this regard the team at Senator were great to deal with, as always," said Greg.

CONSTRUCTION

Based on Senator's standard 770 hull, with enclosed cabin, *Tupaia*'s hull is constructed in 5083 marine alloy with 6mm ►

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SENATOR

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For a small boat the wheel house is spacious



Inside the main command and surveyor station



The transom is modified to take the MBES



Nearing completion in the shed

hull, 3mm pontoons and cabin. She's made with additional pontoon bulkheads in place to strengthen the sides for potential side mount transducers (and to meet Maritime NZ's MOSS standards for a workboat operating in New Zealand's 12 nautical mile near coastal waters). The deck is 4mm tread plate.

Most of DML's large survey projects utilise a Multibeam Echo Sounder (MBES) to collect bathymetry. When these sensors were first introduced to New Zealand, they were (like most early-stage technology) large and cumbersome. Most sensors in those days were fitted in permanent mounts to the bottom of vessels. This meant that full turn-key systems were often fitted

to large vessels – that were also quite expensive to operate. This effectively determined the overall cost of a project to the client.

As technology has evolved, sensors have reduced in size, becoming far more portable, and allowing operators like DML to look for more agile 'mobilisation and deployment solutions'.

To accommodate the Multibeam Echo Sounder into the vessel modifications means including widely-spaced outboard pods to allow for a centrally-mounted hydrographic survey multibeam sonar – mounted in the transom, ahead of the motors on a vertical shaft system. With no boarding platform between the twin outboards there is a rear boarding ladder on the port aft quarter.

The 400 litres underfloor fuel tank was moved forward, up to the deckhouse bulkhead, to ensure correct weight and trim of the vessel. There is an underfloor fish-bin behind the fuel tank for deck drainage, with two large bilge pumps. An 80 litres freshwater tank and pump has been installed further forward under the cabin sole.

Most of DML's large survey projects utilise a Multibeam Echo Sounder (MBES) to collect bathymetry

The forward cuddy has two short bunks, with an electric flush marine toilet as head. There is an opening emergency exit hatch above.

Access forward is via a usable walk-round, fitted with the larger 1020 style bow rail, mounted on the sides of the gunwale. This is to ease access to the bow-mounted fold-out bow ladder, which extends past the anchor and spare-man. This ladder is essential for deploying personnel and equipment ashore.

CABIN

The main cabin can be secured with a sliding stacker locking doors. The entrance way is protected by an extended roof overhang. Outside, protecting the stacker doors to port, is a bench seat with a portable gas cooker under one squab, and a small sink plumbed with cold water under the other. Also, hidden under a plastic hatch is a pull-out shower rose and hose.

Moving inside, the soft anti-glare décor quickly becomes apparent. To port is a raised table with opposing/facing seats.



Underway *Tupaia* is very nimble on the water

This is the main survey computer working area, although other screens and data collecting computers will be mounted nearby.

The main helm and command station is directly ahead to starboard. This position is afforded with excellent all-round vision, with all switches and controls at ease of hand.

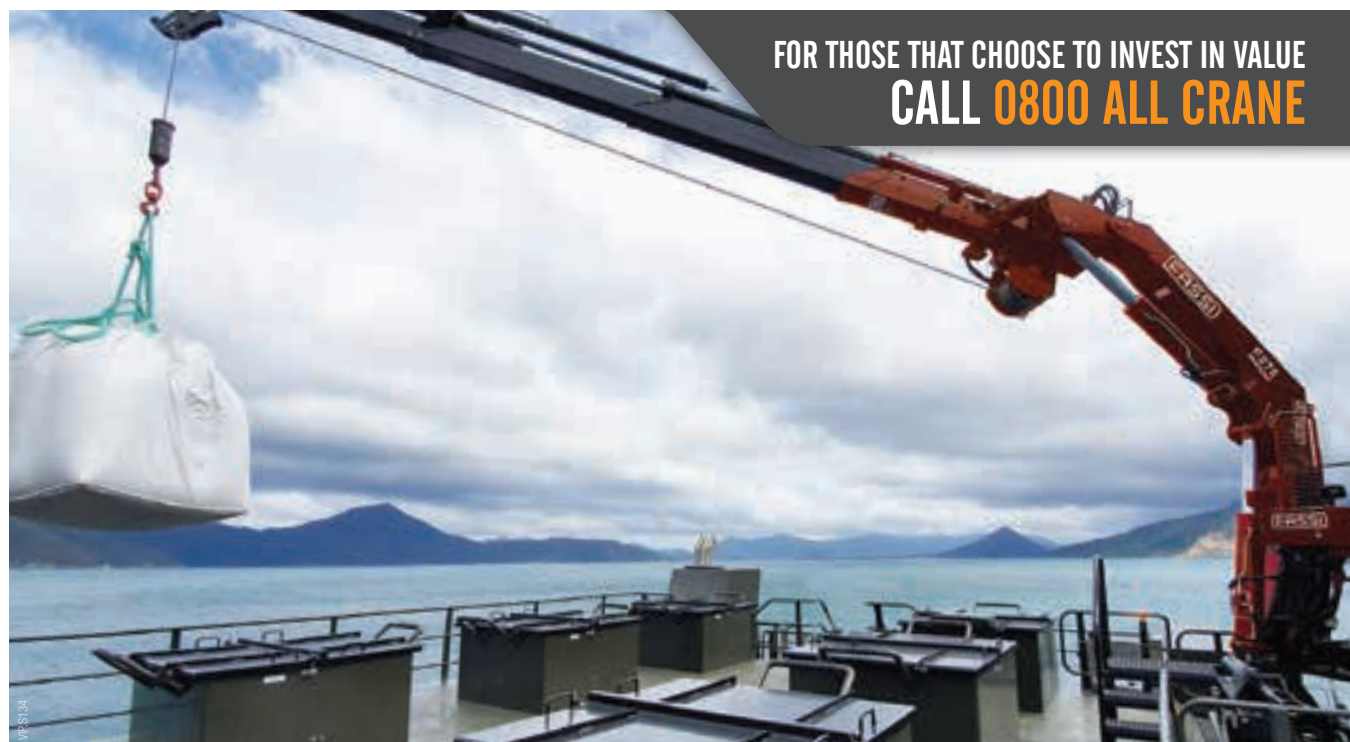
There is a comfortable sprung helm seat for the Skipper's comfort while he or she is doing the long and tedious days of surveying. Central in the command dash panel is a Raymarine electronic screen for navigational aids, including sounder, plotter and radar. Raymarine VHF and AIS is also provided. Besides the two side sliding windows there are two roof light hatches for added ventilation when required.

MERCURY POWER

Mercury outboards were chosen for several reasons, Greg explained, but the major factor was their superior, marine-hardened 'on demand' alternator output compared to other similar sized engines.

The on board high-tech sonar system is thirsty on electric power. Each outboard can produce 80 amps at high revs, or 60 amps at anything higher than 1,000 RPM.

Typically, survey sounding operations are undertaken at speeds of 4 to 7 knots, so each engine can produce enough power for the survey system even at low speeds. This also gives the option of running on one engine at a time in open water operations – ►



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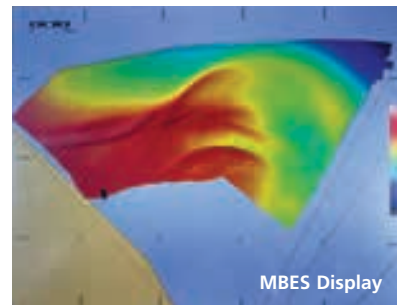
The new transom MBES lifting mechanism is a one man operation



On its trailer *Tupaia* is ready for action



Tucked between the motor pods



MBES Display

which can help to reduce the outboard maintenance cycle.

Mercury's new 150 four-stroke has far less transom well interference, and a lower profile – making it easy to work over and around. The engines incorporate a unique 'Focused Mount System' which we are advised is 22 percent *heavier and tougher* than those found on competitive 150hp outboards.

As part of its world-class sound/noise management technology, the Mercury 150hp four-stroke features a special idle exhaust relief system. This, apparently, can be likened to a simple baffle design with a 'low pass' acoustic filter to weaken high frequency exhaust noise at idle or low speeds. The effect of this quieter operation at low speeds makes it easier to converse while on the boat – far less fatiguing, and easier on the crew's ears during a long day of surveying.

MOUNTING THE GEAR

When the survey vessel is in transit, at speed, to a survey area, the MBES system is raised from the water to avoid unnecessary drag and to avoid damaging the sensors.

Many operators use side mounts to raise and lower their MBES, particularly on smaller vessels, as in the company's vessel *Taniwha*. A moon pool system is another favoured option: the system is deployed and retrieved through a purpose-built hole in the deck and hull. Moon pools tend to suit larger vessels as they require an obvious use of valuable deck space.

To overcome this, the DML team are trialling a *rear mount* MBES system on *Tupaia*. For this reason, *Tupaia's* engine pods were extended to ensure the outboards are kept well aft of the MBES.

Local engineers Hawkins Marine were commissioned to design a mechanism to enable the easy and safe deployment and retrieval of the MBES. The bespoke pole mount requires a single operator and is, apparently, incredibly easy to use.

HYDROGRAPHIC MULTIBEAM ECHO SOUNDER

Tupaia is fitted with a state-of-the-art multibeam echo sounder. The Reson T50 model used is capable of operating in water depths out to 600m – however its main purpose is harbour and

coastal surveys for navigational requirements.


The device transmits *512 beams* – each being 0.5 x 1.0 degrees – providing high resolution seabed imagery capable of identifying objects less than 0.5m in size on the seabed.

It can operate a swathe width beyond 140 degrees, providing a swathe coverage of up to six times the water depth ensuring a high speed of data capture. As well as depth information, the system is also capable of recording backscatter seabed imagery and water column data, which is being used more and more for science purposes.

When not on the water, *Tupaia* is housed and transported on its own purpose-built tandem axle DMW trailer, which makes for an impressive sight when seen heading down the highway.

In short, *Tupaia* is not only designed to be the 'perfect survey platform', she also looks pretty sharp in her new Discovery Marine Ltd-branded decals.

Once the COVID-19 lockdown is lifted, the DML team will be eager to get back to working around New Zealand's coastline and putting her through her paces.

All in all, a very comfortable workspace for surveying and a far cry from the 'Ghost of the Coast' – the survey ship *HMNZS Lachlan* – whose ship's boats we relied on for much of the nearshore coastal surveys in the old days. I can see many an old 'doggie' (Hydrographer) when reading this, will turn green with envy. 

SPECIFICATIONS

Certification	Non-Passenger Workboat (Surveyed for 9 persons)
LOA	7.93m
Beam	2.49m
Draft	0.5m at rest
Designer	Senator Boats
Builder	Senator Boats, Napier
Power	Twin Mercury 150HP four stroke outboards
Operational Limits	All Inland waters and all inshore limits as per Part 20, of Maritime Rules, operating within 12Nm around New Zealand