Development of prawn fleet spatial management and profitability tools using tablet based technologies

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Background

The prawn fishing industry in Spencer Gulf, South Australia, has faced significant challenges in data management and decision-making efficiency. In 2017, Real Time Data, in collaboration with the Spencer Gulf and West Coast Prawn Fishermen's Association and SARDI/PIRSA, initiated a project to address these challenges using advanced tablet-based technologies. This initiative aimed to replace outdated systems with a modern solution, providing real-time, actionable data to fleet managers and prawn trawl skippers, thereby enhancing operational effectiveness.

Aims/objectives

The primary goal was to develop and implement the Deckhand Workflow Application, a tablet-based tool designed to improve the spatial management and profitability of prawn fleets. Key objectives included enhancing data accuracy, streamlining compliance reporting, and supporting real-time decision-making in fishing operations.

Methodology

The methodology centred on the development of two main components:

1. **The Deckhand Workflow Application:** This software facilitates real-time data collection on vessels, optimising data entry processes. It is customised to collect only essential data, utilising automatically filled fields and data validations to ensure efficiency and accuracy. For example, skippers need only tap the screen twice to record the start and end of a fishing effort; the application automatically calculates and records coordinates (latitude and longitude) for the start and end of a shot, fishing block based on shape files built into the software, average speed travelled, total distance travelled, effort midpoint (latitude and longitude), as well as time and dates. The events activity date is also adjusted such that efforts recorded in the early hours use the previous day's date. These features were refined over multiple test trips with industry dual reporting to ensure the workflow accurately matched the real fishing behaviours within the fishery while also requiring the absolute minimal input from operators while actively fishing.

2. **An Economic Framework:** Developed independently as a separate Excel spreadsheet, this framework includes variables such as fuel costs, fuel efficiency, vessel maintenance, refrigeration, packaging, license fees, and capital costs associated with vessels and loans. This framework aims to analyse the economic impacts of fishing decisions, determining the profitability of different catches. It was originally intended for integration with a central data dashboard via Deckhand, which would streamline access and usability.

The Deckhand Workflow Application was successfully integrated with the PIRSA API v1.0 and later with updated v2.0, enhancing regulatory compliance and data sharing capabilities. However, the economic framework, while designed to provide preliminary profitability analyses, remained separate and was not integrated or field-tested due to a shift in project scope. Although no 'real-world' data was collected for this framework, integration remains an objective for the fishery and may be pursued in the future.

Results/key findings

- **Integration Success:** The Deckhand Workflow Application was successfully integrated with the PIRSA API, enhancing compliance and data sharing capabilities.

- **Economic Framework Development:** An economic framework was developed to assist in profitability analysis. Although it remains separate and untested, it provides foundational insights for future economic analysis within the industry.

- **Positive Feedback on Deckhand Application:** Fleet skippers provided positive feedback during field tests, appreciating the application's real-time data management and reporting features, which significantly expedited data recording.

Implications for relevant stakeholders

The development of the Deckhand Workflow Application and the economic framework represents an important step forward in utilising technology to enhance the management and profitability of prawn fleets. While the application has begun to transform data handling within the industry, the full extent of management or economic benefits has yet to be quantified. As such, these advancements should be seen as providing a strong foundation for future enhancements rather than definitive improvements at this stage. The economic framework, in particular, offers potential for further development and integration, which could yield comprehensive business insights once fully implemented and integrated.

Recommendations

- **Integration of Economic Framework:** Future developments should consider integrating the economic framework with the Deckhand application to streamline the process of profitability analysis, providing skippers seamless access to operational and economic data.

- **Expansion of Economic Framework Features:** Enhancing the economic framework to include automated data inputs and more complex analytical capabilities could significantly benefit users, allowing for more dynamic and detailed economic assessments.

- **Broader Implementation and Continuous Improvement:** We recommend promoting the broader use of the Deckhand application along with other electronic data reporting platforms across various fishing fleets and regions. These tools not only support regulatory compliance but also enhance operational efficiencies and data accuracy. By leveraging their capabilities to track performance metrics such as individual fisher efficiency and real-time stock assessments, these platforms provide valuable insights that extend beyond regulatory needs, contributing to sustainable fishing practices. Collaborating with industry bodies and regulators is crucial to demonstrate these benefits and facilitate a transition from paper-based systems, ultimately improving daily operations and long-term strategic planning for increased sustainability and profitability within the industry.

Keywords

Prawn Fleet Management; Spatial Data Management; Tablet-Based Technologies; Real-Time Data Collection; Economic Framework; Fisheries Technology Integration; Regulatory Compliance; Sustainable Fishing Practices; Profitability Analysis; King Prawn; *Melicertus latisulcatus*

Introduction

The prawn fishing industry is a vital component of Australia's seafood sector. While the Spencer Gulf region of South Australia is known for its robust and MSC-certified prawn fishing operations, it also faces challenges such as evolving regulatory demands and the need for sustainable resource management. In response, Real Time Data launched the project "Development of Prawn Fleet Spatial Management and Profitability Tools Using Tablet-Based Technologies" in 2017. This initiative aimed to revolutionize traditional fleet management methods by incorporating advanced digital tools to enhance operational efficiency and profitability.

The committee at sea within the Spencer Gulf Prawn Fishery currently manages its operational decisions using an Excel spreadsheet that aggregates relevant data for review. This process allows for timely adjustments to fishing strategies based on real-time environmental and stock assessments. The "Development of Prawn Fleet Spatial Management and Profitability Tools Using Tablet-Based Technologies" project aimed to enhance this system by integrating the data collection process with regulatory compliance and automatically collating the data for quicker, more informed decision-making by the committee. This integration promised to provide richer data and reduce the time required for data preparation, ultimately supporting more effective and efficient management of fishery resources.

The project's cornerstone was the Deckhand Workflow Application, designed to facilitate a shift from paper-based logs to a sophisticated digital format. This transition was not just about compliance with the latest regulations but also about enhancing data accuracy and accessibility. Moreover, Deckhand serves as a flexible platform for the fishery, capable of capturing a complete trip path and is also used to collect non-regulatory data such as 'bucket count' and 'bucket weight', which are important metrics that the committee at sea uses to inform their decisions. This adaptability makes Deckhand an invaluable tool for both regulatory compliance and operational intelligence. Such improvements were expected to significantly advance how data is managed across the fleet, promoting more efficient and adaptable fishing practices.

During the project's lifespan, Real Time Data had to adapt to changing technological and regulatory environments, which included integrating the Deckhand application first with PIRSA API v1.0 and subsequently with v2.0 as the APIs evolved. This adaptation was crucial for maintaining compliance with regulatory requirements.

Additionally, the initial scope of the project included the development of an economic framework to complement the Deckhand application. However, due to subsequent changes in the project's scope which resulted in no real world data being collected for many of the economic tools inputs, this component was not fully integrated or tested. It remained a separate entity, developed to provide foundational economic insights but not fully realised within the project's framework. This framework will be submitted as part of the project submission, and future integration could involve updating the Deckhand Workflow Application to collect additional data required by the economic framework. Additionally, the entire trip path and distance values could be used as part of the inputs. Much more work would be required to validate this approach, as well as to address the requirements for users to enter their private information.

Through this project, Real Time Data and its partners sought to demonstrate the transformative potential of tablet-based technology in revolutionising fisheries management. The anticipated outcomes included not only increased operational efficiency and enhanced data-driven decision-making but also a significant boost in the profitability of operations, all while upholding the highest standards of environmental stewardship. It would be beneficial for future project recommendations

to also explore how the integration of the economic framework with the Deckhand application might be implemented. Ideally, the economic framework would be informed by data collected by Deckhand from committee members and potentially all fishers. This data could then be reviewed and analysed by the industry-led co-management committee, using calculated indicators to present key decision metrics, thereby making the process more efficient and accurate.

Objectives

The primary aim of the "Development of Prawn Fleet Spatial Management and Profitability Tools Using Tablet-Based Technologies" project was to enhance operational efficiency and economic viability of the prawn fishing industry in Spencer Gulf through innovative technological solutions. Below are the original objectives set at the project's inception, alongside any modifications that were necessary due to the evolving project demands and external factors:

Objective 1:

• **Original**: "Develop a tool to digitally capture and report spatial fishery technical, management, and economic data in real time."

• **Revised**: "Develop a tool to digitally capture spatial fishery technical, management, and economic data in real time."

Objective 2:

• **Original**: "Develop spatial & fishery profitability measures and pre-fishing decision tools."

• **Revised**: "Develop integration to digitally submit spatial fishery technical, management, and economic data in real time."

Method

The methodology of the "Development of Prawn Fleet Spatial Management and Profitability Tools Using Tablet-Based Technologies" project was carefully designed to address the unique needs of the prawn fishing industry in Spencer Gulf and the West Coast. The approach was systematic and involved several key phases:

1. **Software Development of the Deckhand Workflow Application:**

   o The Deckhand Application was developed as a tablet-based tool to capture and manage real-time spatial and operational data from prawn fishing vessels. The software was crafted with a user-friendly interface suitable for the challenging marine environment, ensuring robustness and ease of use.

   The development process involved extensive scoping work with industry stakeholders including the Executive Officer, key fishers, and fishery scientists. This collaborative approach was crucial to deeply understand the operational needs and dynamics of the fishery. Workflow diagrams were created and shared with all stakeholders to gather feedback, which was instrumental in refining the application's design.

   Ease of use was a key focus, continuously refined over at least ten fishing trips. Feedback was systematically collated and the workflow was adjusted accordingly, resulting in the addition of many features. For example, the introduction of a shot clock counter that displays how long a shot has been running, and the ability to save the progress of a shot to start recording the next one, allowing users to return and complete the entry with catch estimates when they have more time.

   This iterative process based on trip feedback led to a highly adaptable and efficient tool, crafted to meet the specific needs of the fishery and significantly enhance operational efficiency.

   o The application included security features for data integrity and protection, using iOS for compatibility with tablet technology.

   Security features in Deckhand include the use of personal identification numbers (PINs), which serve as digital signatures and are required to declare reports. This workflow mandates PIN entry to start a trip and for each landing report, enhancing security by ensuring that only authorised users can initiate or modify critical operational data.

   Additionally, Deckhand implements robust user authentication protocols with individual user accounts. These accounts are verified by Real Time Data (RTD) staff before the fisheries-specific workflow is added to their account, ensuring that only verified users can report using this workflow.

   Moreover, integration with PIRSA includes advanced security measures. A notable feature is their ApiToken API, which issues an access token to Deckhand that must be included in every report. These tokens, validated against RTD's PIRSA credentials, timeout every 10 minutes, thereby securing the data transmission process and ensuring that all communication between Deckhand and PIRSA is authenticated and temporary.

2. **Integration with Regulatory Systems:**

   o The application was initially integrated with PIRSA API v1.0 and subsequently updated to integrate with PIRSA API v2.0. These steps were crucial for ensuring regulatory compliance and facilitating efficient data exchange. Each integration phase required close collaboration with PIRSA to align with their data requirements and API specifications, followed by comprehensive testing to ensure functionality and effectiveness.

3. **Economic Framework Development:**

   o The economic framework was developed independently by economist Roger Edwards and project partner Lisa Carlin from BDO EconSearch. This framework was designed to provide skippers with simple tools for preliminary profitability analysis using Microsoft Excel.

   o Kept separate from the Deckhand application, the development of the economic framework was influenced by changes in the project's scope and the need to focus on data already available due to difficulties in obtaining specific operational data such as fuel costs.

4. **Field Testing and Feedback Collection:**

   o Initial User Acceptance Testing (UAT) and dual reporting phases included reconciling data with SARDI to ensure accuracy and reliability. Field tests were conducted in both Spencer Gulf and West Coast prawn fisheries.

   o Field tests (fleet trips) lasting approximately 14 days were used as feedback mechanisms. During these trips, user feedback was collated and analysed to inform necessary changes, aimed at improving the application's performance and user satisfaction.

5. **Training and Adoption Facilitation:**

   o Training sessions were held in person in Adelaide and Port Lincoln, delivered across four sessions directly to skippers to ensure core competency in the use of the Deckhand application. The training was designed to demonstrate the application's features and benefits, ensuring skippers were proficient in its use.

   o Comprehensive training materials, including quick-reference guides, and video tutorials, were developed to support the ongoing use and troubleshooting of the application.

Results

The "Development of Prawn Fleet Spatial Management and Profitability Tools Using Tablet-Based Technologies" project achieved several significant outcomes, demonstrating the effectiveness of the implemented technologies and methodologies:

1. **Successful Deployment of the Deckhand Workflow Application:**

   o The Deckhand Workflow Application was successfully deployed across the prawn fleets in Spencer Gulf and West Coast regions. This integration with PIRSA API v2.0 facilitated seamless data exchange and compliance with regulatory requirements, boosting the efficiency of data management within the fleets.

   o We are pleased to report that the fishery has entered into a five-year contractual agreement to use Deckhand, underscoring the value and trust in this technology.

   o The application proved robust and user-friendly, featuring real-time data capture and management that are particularly beneficial for on-water operations. It collects both regulatory and non-regulatory data, which as part of the new FRDC Project No. 2022-176, will be sent to a central data exchange providing additional insights accessible by the committee at sea. This integration enhances strategic decision-making within the fishery, aligning with ongoing efforts to support sustainable fishing practices.

   o A screen-by-screen walkthrough and training videos that provide detailed workflow explanations have been submitted with this report, offering a deeper understanding of the application's functionality and the data it collects.

2. **Economic Framework Development and Utilisation:**

   o The economic framework, developed as an Excel spreadsheet by Roger Edwards and project partner Lisa Carlin from BDO EconSearch, was intended to provide tools for preliminary profitability analyses. While this framework represents an initial step towards offering a comprehensive financial overview of the fishery, it remains largely theoretical and has not been integrated with real-world data due to shifts in the project's scope.

   o The economic framework developed for the Spencer Gulf prawn fishery utilises a comprehensive range of data inputs to aid fishery decision-making. These inputs include operational costs such as licence fees, insurance, interest on loans, both paid and unpaid labour, legal and accounting fees, telephone expenses, repairs and maintenance, slipping, mooring, boat survey costs, travel, office and administration expenses, fuel, refrigeration, provisions, and packaging. It also integrates direct fishing-related data like survey shot data and market prices. This framework is designed to analyse these diverse inputs to answer critical financial and strategic questions for the fishery. Fishers can use it to determine the financial viability of fishing in specific locations based on the size and type of catch, assess the cost-effectiveness of travelling further distances for potentially better catches, and make informed decisions about where and when to deploy their resources to maximise profitability and efficiency.

   o Currently, the framework is in its nascent stages and has been shared with the FRDC and the industry. However, it requires considerable additional development to

become a fully integrated tool capable of delivering effective economic performance assessments. For future integration, significant enhancements are necessary, including further automation, rigorous testing, and extensive trials to ensure its applicability and effectiveness within the fishery's operational context.

o It was acknowledged that this framework requires considerable extra development to become a fully integrated tool capable of assessing economic performance effectively. To be effective for integration, it would require further automation, testing, and trials.

3. **Field Testing and User Feedback:**

o Extensive field testing yielded positive results, with skippers and crew members providing constructive feedback during and after the trips. This feedback was crucial for refining the Deckhand Workflow Application's functionalities, particularly in enhancing user interface elements and data reporting features.

o Feedback from the fleet trips, which lasted around 14 days each, was systematically collected and analysed. The insights gained led to targeted updates to the application, improving both performance and user satisfaction.

o **Feedback highlights and subsequent refinements included:**

• **Workflow Validations:** Adjustments were made to ensure all reports are completed and submitted in the order required by PIRSA. It took multiple trips to robustly implement a system where all shot reports must be submitted and accepted before a grading report can be filed for the night, ensuring that PIRSA's API does not close off that activity date to further shot reports.

• **Latitude/Longitude Format Adjustments:** Changes to the latitude and longitude format were necessary, prompting additional features in Deckhand to accommodate these modifications.

• **Report Refinements:** Multiple iterations of workflow reports were necessary to ensure all collected data was accurately represented and reviewable, reflecting the dynamic nature of the data collection process.

• **Renaming Mid-Trip Landing Reports:** To eliminate user confusion regarding the completion of trips, the mid-trip landing report was renamed, clarifying its purpose and improving user understanding.

• **Activity Date Accuracy:** The system for deriving the correct activity date for all events required multiple adjustments to handle the varied times and methods skippers used to fill in their grading reports, ensuring data consistency.

• **Unit of Measure Adjustments:** The fishery's preference for estimating catch in pounds but reporting in kilograms necessitated several tweaks to balance user preferences with reporting requirements.

4. **Training Effectiveness:**

o Training sessions conducted in Adelaide and Port Lincoln were highly effective in equipping skippers with the necessary skills and knowledge to utilise the Deckhand

application efficiently. These sessions, totalling four — one in Adelaide and three in Port Lincoln, each lasting approximately two hours, were hands-on and interactive.

o During the sessions, users were guided through simulated fishing trips on their own devices, providing a practical learning experience that allowed them to follow along and ask questions in real-time. This approach ensured that the training was not only about familiarising skippers with the technical aspects of the application but also about ensuring comfort and confidence in using it during their daily operations.

o Additionally, videos were recorded during these sessions and subsequently shared with the fishery. These resources serve both as a refresher for current users and as an introductory guide for new skippers entering the fishery, ensuring ongoing accessibility and support.

o The direct engagement with skippers during these training sessions facilitated a deeper understanding of the application, fostering a positive reception and encouraging its active use across the fleets.

o Feedback on the adoption of the technology varied among the fishers. Initially, some expressed reservations, citing concerns that technology often does not work well for them. However, as the training sessions progressed and with additional support provided during multiple trips, many of these users grew more comfortable and proficient with the Deckhand application. Over time, the majority of users reported a preference for electronic reporting, with only a significant minority remaining resistant to the change.

o This shift in attitudes is in line with general sentiments observed within this demographic. It is hoped that as fishers continue to see practical benefits from the data collected, even those who are currently hesitant will come to appreciate the advantages of the new system. The ongoing adaptation process underscores the need for continued support and engagement to ensure widespread acceptance and effective use of the technology.

5. **Overall Impact on Fleet Operations and Future Developments:**

o The introduction of the Deckhand Workflow Application and the economic framework has marked a significant advancement in the technological capabilities of the prawn fishing industry in the region. These developments have demonstrated their potential to enhance operational efficiency, data accuracy, and provide foundational elements for economic analysis, thus contributing positively to the sustainability and profitability of the fleets.

Efficiency: Electronic reporting via Deckhand has significantly reduced the time required for reporting. Anecdotal evidence from social media posts during trial periods suggests a reduction in reporting times by up to 50%, as skippers can input

data on-the-go without needing to revisit and compile reports post-trip.
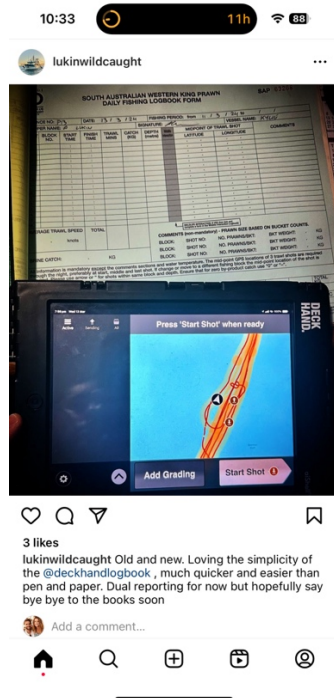
Data Accuracy: SARDI has noted the heightened accuracy of data reported through Deckhand, particularly in trawl speed measurements, which previously tended to be uniform due to estimations. Deckhand's precise tracking has led to queries from SARDI about the variance in speeds, underscoring the system's ability to provide real and accurate operational data.

Location Accuracy: Some challenges with location accuracy were noted, attributed to interference from vessel wheelhouses. The successful trial of an external GPS unit that resolved these issues suggests a straightforward solution for enhancing spatial data reliability in affected vessels.

Economic Analysis: The economic framework remains in its preliminary stages and has not been integrated with real-world data due to project scope changes. It requires further development and validation to become a fully integrated tool capable of effectively assessing and influencing economic decisions within the fishery.

o   A follow-on FRDC project has been initiated, which will utilise the data captured by the Deckhand application along with other data-enabled insights for real-time decision-making at sea. This new project aims to further integrate and leverage the capabilities developed, enhancing the strategic decision-making process during fishing operations.

Discussion

The "Development of Prawn Fleet Spatial Management and Profitability Tools Using Tablet-Based Technologies" project has demonstrated substantial progress towards modernising the prawn fishing industry in Spencer Gulf and the West Coast. The successful deployment of the Deckhand Workflow Application and the establishment of the economic framework reflect a shift towards integrating digital solutions in marine resource management.

Alignment with Initial Objectives:

- The project largely met its primary objectives, though with some modifications. The Deckhand Workflow Application was developed and deployed successfully, achieving the goal of enhancing real-time data management capabilities aboard fishing vessels.

- Integration with PIRSA API v1.0 followed by an upgrade to v2.0 ensured that the application adhered to evolving regulatory standards and improved the efficiency of data exchanges, aligning well with the project's objectives of compliance and operational efficiency.

- The development of the economic framework, not integrated into the Deckhand application as initially planned, still provided valuable economic insights. This framework was developed independently as a standalone Excel spreadsheet.

Project Challenges and Adaptations:

- A significant challenge was the integration of real-time data management with economic analysis capabilities. The initial plan to integrate these functionalities was revised due to technical and project management constraints, leading to the independent development of the economic framework.

- Feedback from field testing was crucial in identifying areas for improvement, particularly in enhancing user interfaces and data processing capabilities. The iterative updates made in response to this feedback underscore the adaptive approach taken throughout the project lifecycle.

Implications for Future Projects:

- The successful implementation of the Deckhand Workflow Application in the Spencer Gulf prawn fishery demonstrates the potential for broader application of similar technologies across other fisheries. This project has provided key insights into how technology can enhance both compliance and operational efficiency, offering valuable lessons that can inform future initiatives and lead to improvements in fisheries management.

  Key lessons learned include:

  Detailed Data Collection: The application facilitated the collection of specific operational data such as 'bucket count' and 'bucket weight,' which, while not directly related to compliance, are vital for day-to-day management decisions. This capability can help bridge the gap between regulatory data requirements and the practical informational needs of fishery management.

  Improvements in Data Accuracy: Deckhand's ability to record precise operational data like trawl speeds and locations has been confirmed, providing fisheries management with reliable data that was previously prone to human error in manual logs.

Potential for Future Integration: The economic framework developed alongside Deckhand, though not fully integrated or field-tested, has laid the groundwork for potential future incorporation. It suggests a path forward for integrating economic analysis with operational data to further enhance decision-making processes.

- The experience gained from this project underscores the importance of technology in modernising fishery operations. As fisheries continue to adopt digital tools, they can expect to see not only improved compliance with regulations but also an increase in operational efficiencies. Future projects could expand on these foundational achievements, further integrating detailed operational data with economic analyses to provide comprehensive insights into fishery management.

- The follow-on FRDC project, which aims to utilise data from the Deckhand application for real-time decision-making at sea, represents a direct continuation of this work. This initiative is set to further the capabilities developed, enhancing strategic decision-making and potentially leading to more sustainable fishing practices.

Overall Impact:

- The project has not only achieved its goals but also laid a foundation for future enhancements and research. The successful integration of technology demonstrated by the Deckhand Workflow Application in the fishing industry offers a model for other sectors looking to enhance operational efficiency and data-driven decision-making. This evolution of technology in fishing shows that new tools must earn their place in the wheelhouse. Fishers rapidly adopt and utilise a range of technologies, but they have high standards for usability and performance.

  Any new technology introduced must prove itself to be user-friendly and effective; otherwise, it risks being sidelined. Fishers will not tolerate software that is difficult to use or performs poorly, as these tools are essential for their daily operations and decision-making. The integration of such technology in the fishing industry, exemplified by this project, may mark the next step in the evolution of tech and digital adoption for fishers, setting a precedent for the implementation of future technological advancements that must be equally robust and reliable.

Conclusion

The "Development of Prawn Fleet Spatial Management and Profitability Tools Using Tablet-Based Technologies" project has successfully demonstrated the efficacy of integrating advanced digital tools into the prawn fishing industry. The Deckhand Workflow Application, developed and implemented throughout the project, has proven to be a significant advancement in real-time data management for prawn fleets operating in Spencer Gulf and the West Coast regions.

Key Achievements:

- **Successful Deployment and Integration:** The Deckhand Workflow Application was not only successfully deployed but also seamlessly integrated first with PIRSA API v1.0 and later with v2.0, meeting regulatory compliance needs and enhancing the efficiency of data exchanges.

- **Economic Framework Development:** The economic framework, developed independently as an Excel spreadsheet by Roger Edwards and Lisa Carlin from BDO EconSearch, provided valuable insights into the profitability of operations, despite not being integrated into the Deckhand application. This framework provides a basis to become a useful resource for industry and will likely inform future projects.

- **Positive User Feedback and Adoption:** Feedback from the fleet has been overwhelmingly positive, with many skippers noting improvements in data management and decision-making capabilities. The training sessions held in Adelaide and Port Lincoln were pivotal in fostering competence and confidence among skippers using the new technology.

Impact on Industry: The project has set a precedent for how technology can be leveraged to enhance operational efficiencies and economic performance in the fishing industry. The tools developed have not only improved the day-to-day operations of prawn fleets but have also opened up new avenues for data-driven management practices.

Future Directions: The initiation of a follow-on FRDC project, which will utilise the data collected by the Deckhand application along with other data-enabled insights for real-time decision-making at sea, is a testament to the project's success and its potential for scaling. This next phase will expand on the capabilities developed here, potentially revolutionising fisheries management practices further.

In conclusion, this project has marked a transformative step for the prawn fishing industry by effectively merging technology with traditional fishing practices. The continued development and refinement of these tools promise to enhance not only the sustainability of the fisheries but also their profitability and environmental compliance.

Implications

The "Development of Prawn Fleet Spatial Management and Profitability Tools Using Tablet-Based Technologies" project has several significant implications for the prawn fishing industry, regulatory bodies, and environmental management practices:

1. **For the Prawn Fishing Industry:**

    o   **Operational Efficiency:** The implementation of the Deckhand Workflow Application has streamlined the data collection process, setting the stage for future improvements in operational efficiency once the data begins to be actively shared and utilized within the fishery's management practices. Although the operational data collected is not yet being shared or used to inform management decisions, the potential for enhanced efficiency and resource optimisation is significant. Preliminary feedback indicates that the use of the application could reduce reporting times by up to 50%, allowing skippers to dedicate more time to fishing activities. This projected efficiency gain promises to support the fishery's spatial co-management strategy in the future by providing more accurate and timely data, which could enhance collective decision-making and sustainability efforts once fully integrated.

    o   **Economic Decision-Making:** With the development of the economic framework, although currently separate and untested, there is potential for this framework to positively impact economic decision-making processes by providing foundational insights into real-time profitability.

2. **For Regulatory Bodies:**

    o   **Compliance and Monitoring:** The integration of the Deckhand application with the PIRSA APIs (initially v1.0 and later upgraded to v2.0) facilitates improved compliance with fishing regulations and enhances monitoring capabilities. This can lead to more effective real-time management of fishing quotas and effort.

    o   **Data-Driven Regulations:** The reliable and timely data provided by the Deckhand application can assist regulatory bodies in making informed decisions and updating regulations based on accurate, real-time information from the field.

3. **For Environmental Management:**

    o   **Research and Conservation Efforts:** Enhanced data collection and analysis tools foster better research opportunities and conservation efforts, contributing to more informed environmental policies and practices.

4. **Broader Implications for Technology Adoption:**

    o   **Innovation in Traditional Industries:** The success of the project illustrates the benefits of introducing innovative technologies into traditional industries. It serves as a model for other sectors within fisheries and beyond, demonstrating the potential for digital transformation to drive efficiency and sustainability.

    o   **Future Research and Development:** The outcomes encourage further research into integrating additional functionalities, such as environmental monitoring and advanced economic analyses, into the Deckhand platform. This could lead to more

comprehensive management tools that incorporate a wider range of data inputs and analytical capabilities.

Recommendations

Based on the outcomes and learnings from the "Development of Prawn Fleet Spatial Management and Profitability Tools Using Tablet-Based Technologies" project, the following recommendations are proposed to ensure continued progress and to maximise the benefits of the technologies developed:

1. **Integration of Economic Framework with Deckhand Application:**

   o Develop and consider the potential integration of the economic framework within the Deckhand Workflow Application. Although initially developed separately, integrating this framework could streamline the process of economic analysis, making it more accessible and effective for skippers in real-time decision-making.

2. **Expansion of Training Programs:**

   o Continue and expand the training programs to include not only skippers but also other fleet personnel who could benefit from using the application. Consider developing online training modules that can be accessed remotely to increase reach and flexibility.

3. **Enhance Data Analytics Features:**

   o Invest in advanced data analytics features for the Deckhand application, including predictive analytics and machine learning capabilities. These enhancements would provide skippers with deeper insights into fishery dynamics and potentially improve catch strategies based on historical data and trend analysis.

4. **Broader Application Deployment:**

   o Promote broader use of the Deckhand application alongside other electronic data reporting platforms across various fishing fleets and regions. Working in collaboration with industry bodies and regulators is essential to demonstrate the comprehensive benefits of these technologies. These platforms not only support regulatory compliance but also enhance operational efficiencies and the accuracy of data reporting. By leveraging the capabilities of the Deckhand application to include performance metrics, such as individual fisher efficiency and real-time stock assessments, the tool can provide valuable insights that contribute to sustainable fishing practices. This integration will facilitate the transition from paper-based systems, offering more dynamic and informed management of fisheries resources. Such a shift is expected to improve both daily operational decisions and long-term strategic planning, leading to increased sustainability and profitability within the industry.

5. **Longitudinal Study on Impact:**

   o Initiate a longitudinal study to assess the long-term impact of the Deckhand Workflow Application on fleet operations, economic performance, and sustainability practices. It should be noted that no baseline data was collected during the initial phases of the project. However, to facilitate a comprehensive analysis, it may be possible to retrospectively collect baseline data from the fishery's historical records. This data would serve as a reference point for evaluating the effectiveness of the digital tools implemented and understanding the broader impacts on the fishery.

Such retrospective analysis could provide valuable insights into operational efficiency, economic performance, and sustainability outcomes influenced by the adoption of the Deckhand Workflow Application.

6. **Feedback Loop Enhancement:**

   o   Establish a continuous feedback loop with users to ensure that the application evolves in response to the changing needs of the industry. This could involve regular workshops, feedback sessions, and updates to the application based on user input.

7. **Follow-On Projects:**

   o   Subsequent projects that build on the current project's achievements, particularly those that can use the collected data for further innovations in fisheries management. These projects could explore additional functionalities such as environmental monitoring and compliance tracking.

Extension and Adoption

The successful extension and adoption of the technologies developed through the "Development of Prawn Fleet Spatial Management and Profitability Tools Using Tablet-Based Technologies" project are critical for achieving lasting impact. The strategies employed to ensure widespread use and acceptance of the Deckhand Workflow Application are outlined below:

1. **Targeted Training Sessions:**

   o Targeted training sessions were conducted in Adelaide and Port Lincoln, focused primarily on skippers who are direct users of the Deckhand application. These sessions provided hands-on experience and were essential in building confidence among users, facilitating the adoption of the technology in daily operations.

2. **Stakeholder Engagement:**

   o Continuous engagement with stakeholders, including fishing associations, regulatory bodies, and technology partners, was maintained throughout the project. This engagement helped align the project outputs with industry needs and regulatory requirements, ensuring relevance and practicality.

3. **Communication Materials:**

   o A range of communication materials was developed to support the adoption of the Deckhand application. These included quick-reference guides and video tutorials, all designed to enhance understanding and ease of use.

4. **Feedback Mechanisms:**
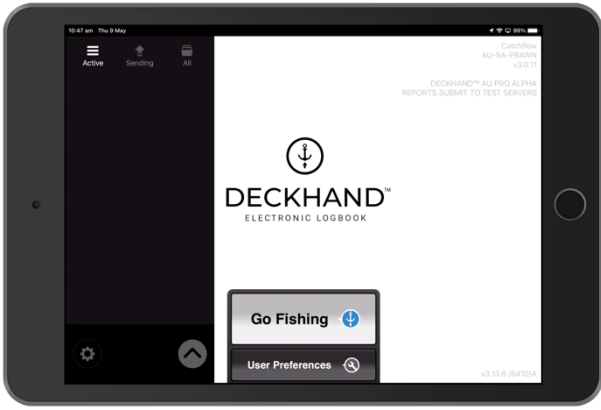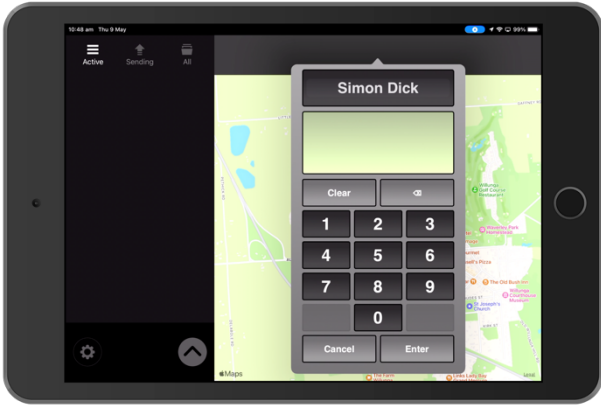
   o Regular feedback mechanisms were established to capture user experiences and suggestions for improvements. These insights have been crucial in refining the application and addressing any challenges encountered by users.

Project materials developed

As part of the deliverables for this project, several key resources have been developed and are available for review and use:

1. **Economic Framework:** The Economic Framework developed during the project is included in this report. This framework provides a structured approach for economic analysis within the fishery, designed to enhance profitability insights.

2. **Workflow Diagrams:** Detailed diagrams that guided the development of the Deckhand Workflow Application are available. These diagrams illustrate the process flow and data interactions, serving as a blueprint for understanding and replicating the application's functionality.

3. **Training and Walkthrough Videos:** A series of videos has been produced to facilitate training and provide a comprehensive walkthrough of the Deckhand application. These resources are designed to assist new users in quickly becoming proficient with the application and to serve as a refresher for existing users.

4. **Screenshots and Descriptions:** Screenshots of the workflow along with detailed descriptions are included to provide a visual and textual representation of how the Deckhand application functions. These can be viewed in the section below.

Overview of the advanced workflow that was developed.

	Deckhand home screen. Users select the 'Go Fishing' button to begin a prawn trip.
	PIN entry Users must enter their PIN number (digital signature) in order to begin a trip.
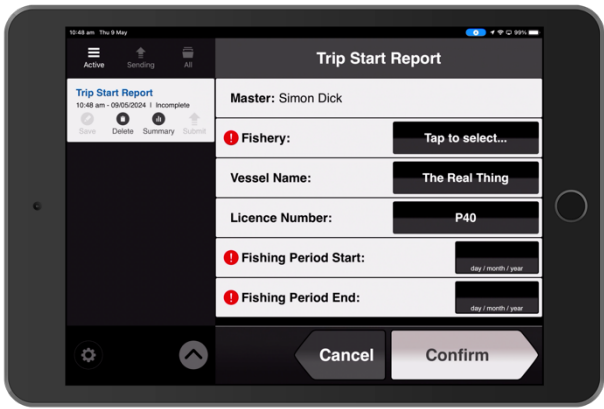
Trip Start Report

Users must complete a Trip Start Report at the beginning of every trip.

Note the red validation errors, these ensure all required fields are completed before progressing.
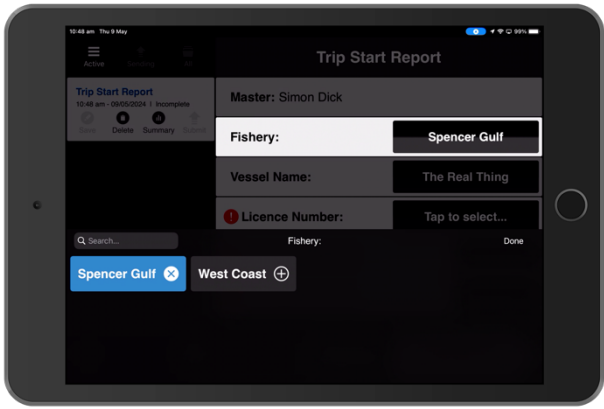
Users are able to select the appropriate fishery, this setting is remembered.
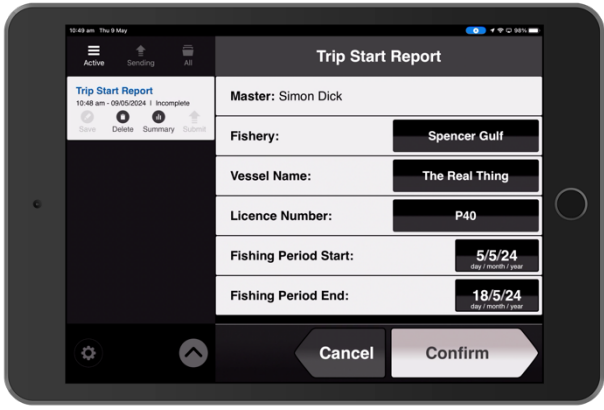
Master is derived from the PIN, Fishery, Vessel Name & Licence number are remembered. The only manual fields are the fishery period start and end dates.
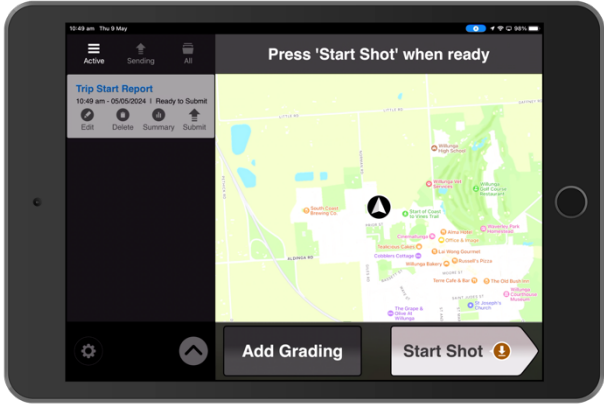
The Trip Start Event on the left can now be 'Submitted' to PIRSA by pressing the 'Submit button.
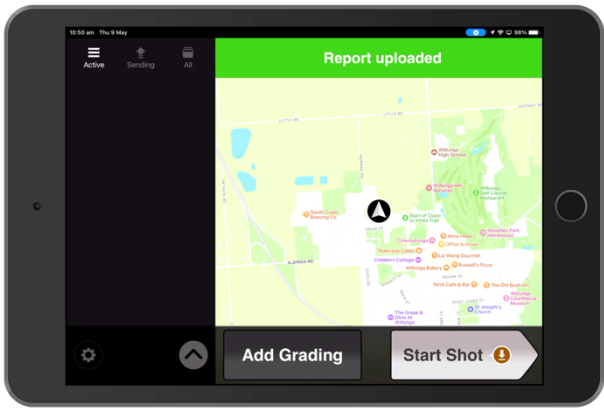
A banner notification is displayed once the report is sent.
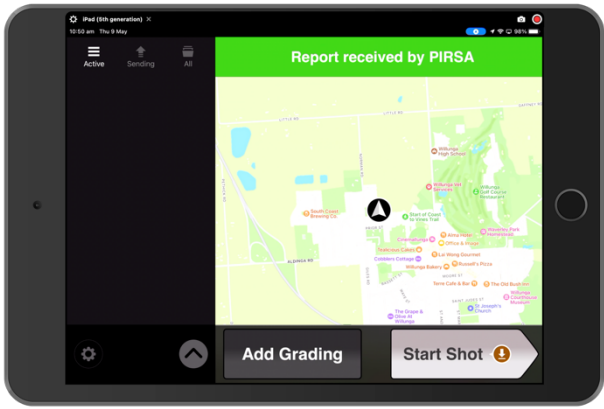
A banner notification is also displayed once the report has been successfully received by PIRSA.
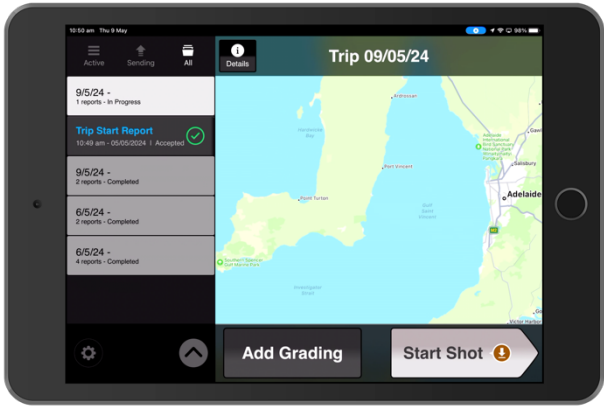
The All area allows users to see all events, including previous trips, as well as the status of events. Here you can see that the trip start report was 'Accepted'.
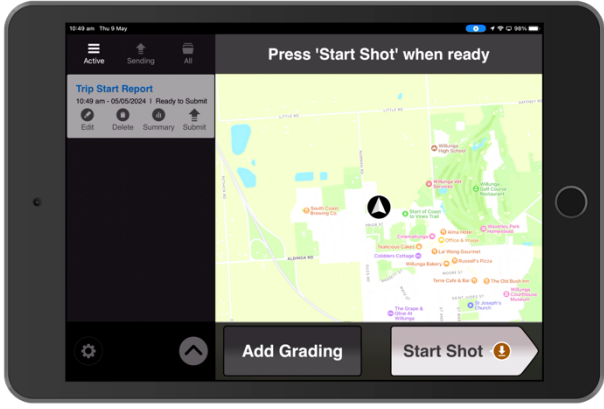
Map View.

Users can record fishing activity, grading reports or declare no activity when not fishing.

Press the 'Start Shot' button to begin recording a shot.
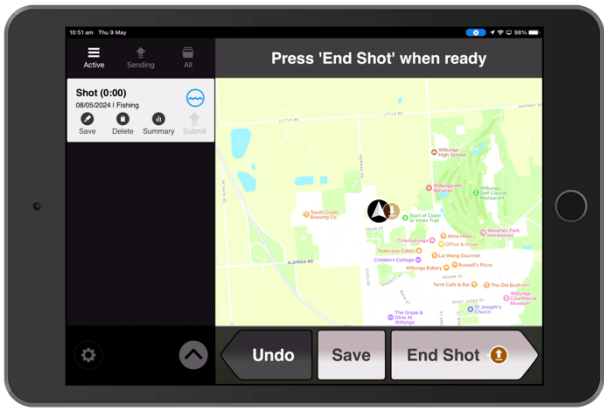
	As the shot progresses a line is drawn on the map showing the path. Additionally, a 'Shot clock' can be seen in the event on the left (currently showing 0:00) that provides a timer for the active shot. To finish a shot, press 'End Shot'.
	Shot details. Users often press the 'Save' button on this view so they can start another shot, returning later to fill in the details. Users manually add a catch estimate, all the shot details are automatically completed by Deckhand.
	'Trawl duration', 'Catch rate', 'Mid point Location', 'Block', 'Trawl Distance' & 'Speed' are all auto completed by Deckhand.
	Users can add a 'Wildlife interaction' if it occurred plus Bucket Count and Bucket weight if required. Continuing will complete the Shot Event.
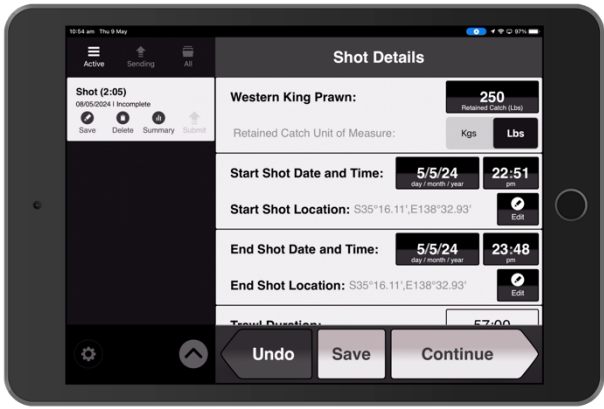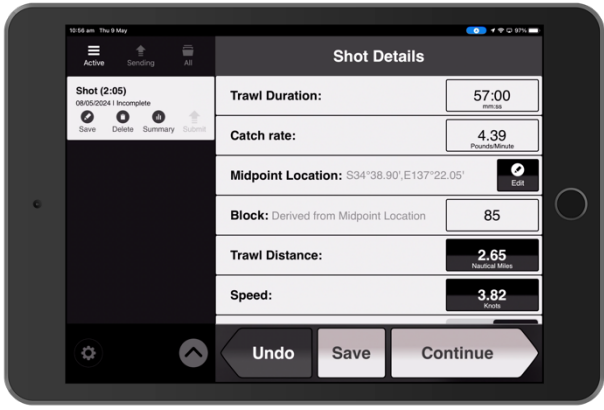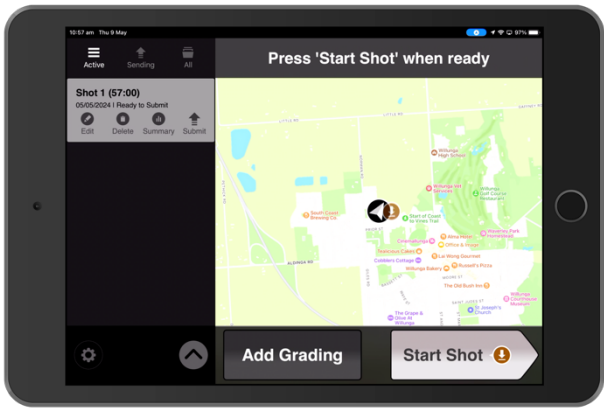
Users come back to the Map screen or if another shot is active they return there.
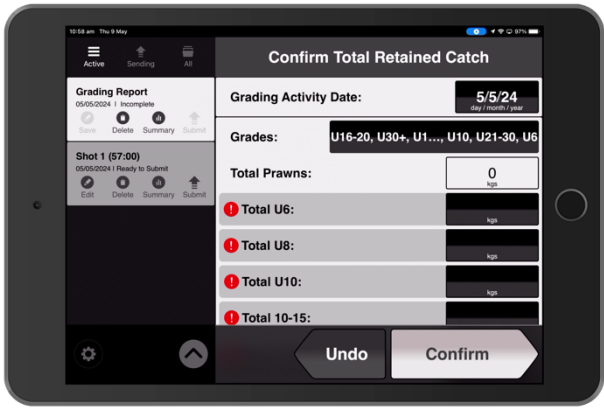
After fishing is complete, users can create a 'Grading Report'.
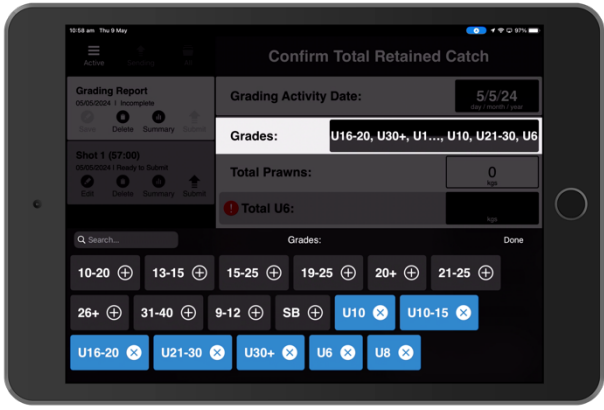
Users can select their relevant grade types and this is remembered.
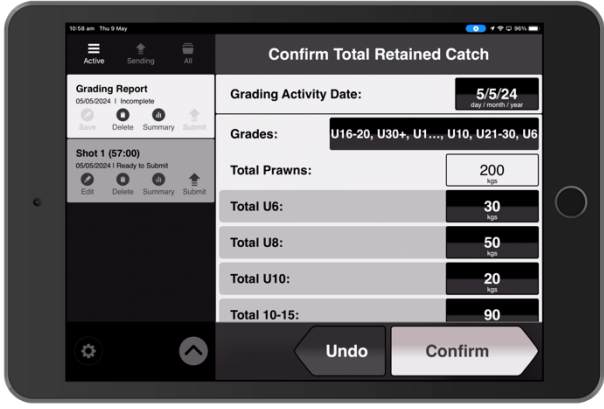
As the user enters grading information 'Total Prawns' auto calculates helping the skipper ensure the values are accurate.
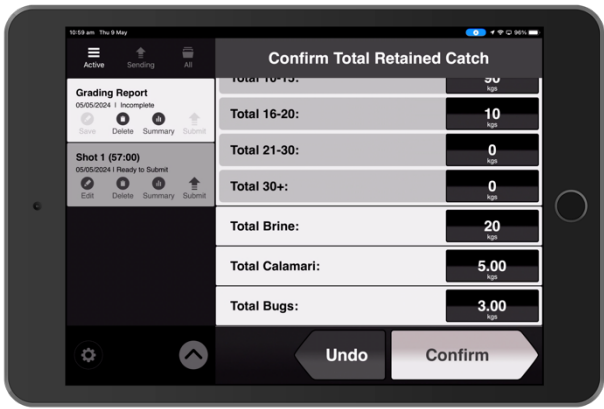
All the additional fields of the grading report.

Pressing 'Continue' takes you to the second screen.
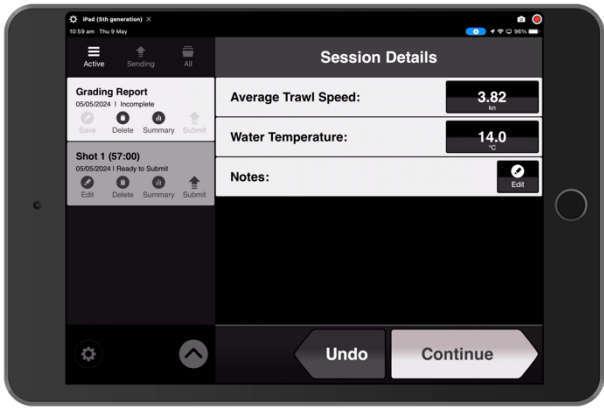
'Average Trawl Speed' is auto filled however 'Water Temperature' is manually entered.
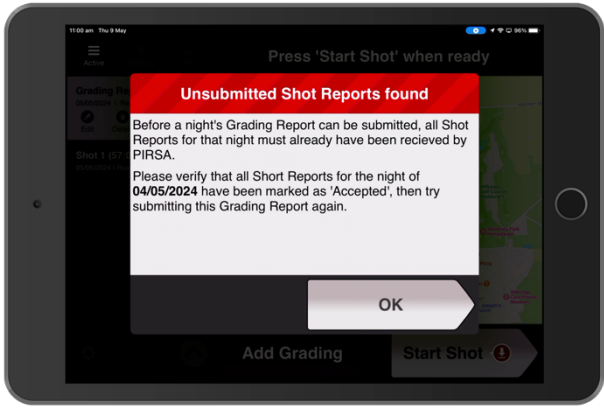
If a user attempts to submit their grading report before submitting all their shot reports, they receive a validation error. This ensures they meet the requirements of the PIRSA API which closes activity dates once a grading report has been received.
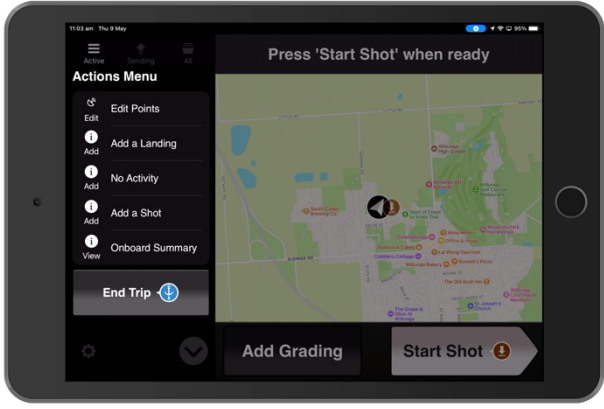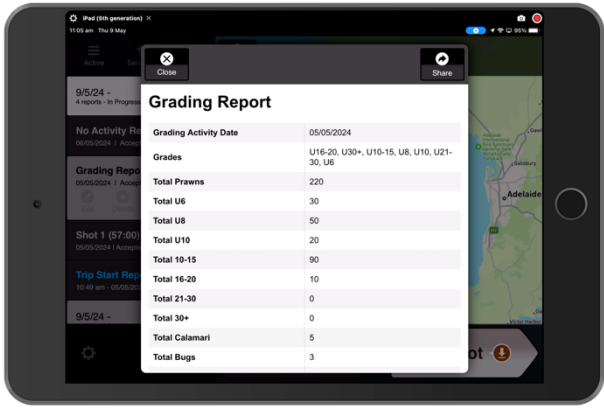

If users don't fish for a night, PIRSA require that a 'No Activity' report be sent. This can be access via the 'Actions Menu' in Deckhand (as well as other features like mid trip unloads).
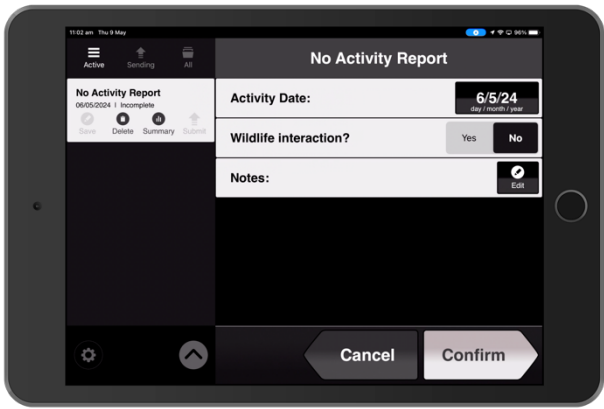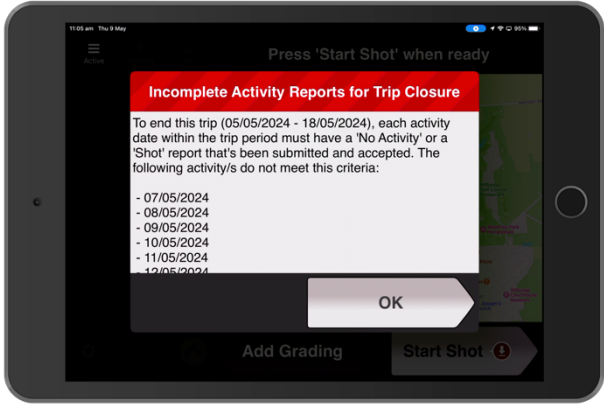
Users complete the required fields in the 'No Activity' Report and submit as per other reports.
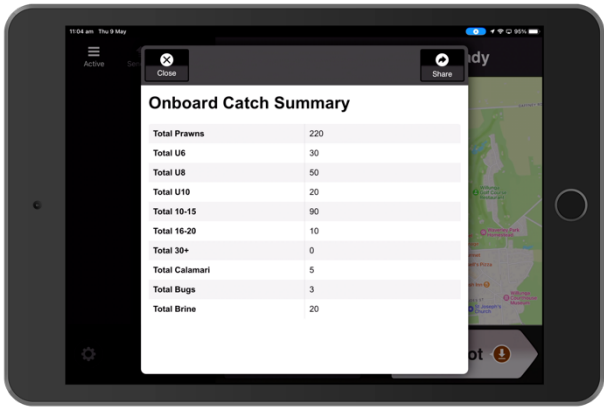
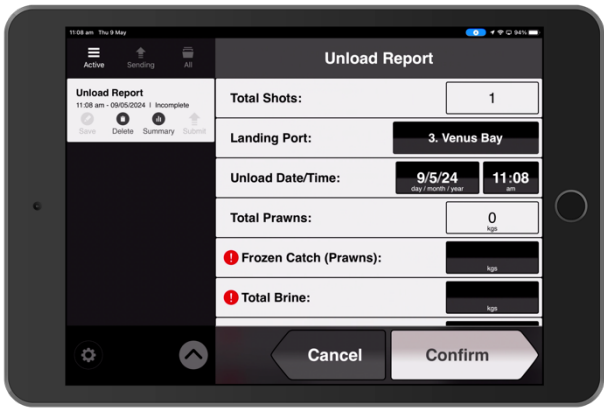The 'Actions Menu' also enables users to view a report on the 'Onboard Catch'.

They can also view reports for every completed event to review.

Finally, once the trip is completed, users can also 'End Trip' via the 'Actions Menu'.

Advanced validations ensure that either a 'Shot' report of 'No Activity' report have been submitted and accepted for all activity days in the trip.
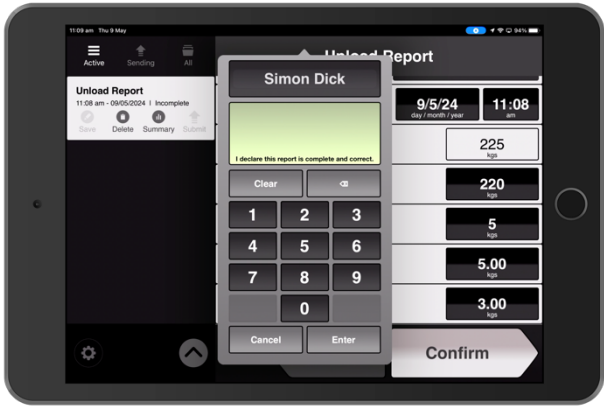
If validation passes, the user is taken to the final 'Unload' report.
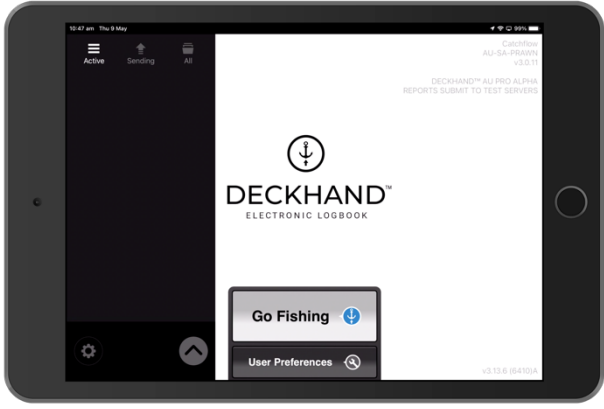
Users manually enter the final unload values.
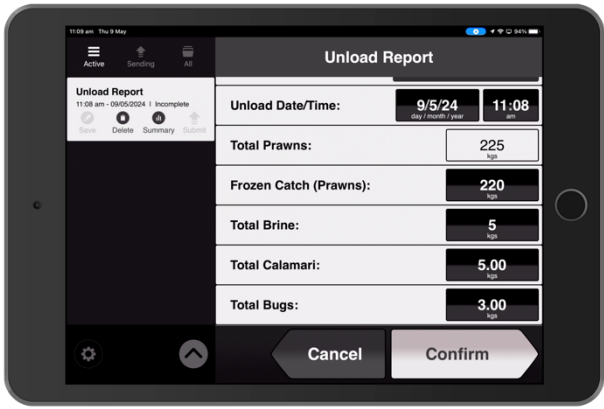
A 'Total Prawns' calculation helps skippers ensure their values are accurate.

To complete the final unloading, the skipper must once again enter their PIN.

Users are returned to the Deckhand home screen ready for the next trip.