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PAMGuard Maintenance – Final Report on Activities Between Oct 2014 and March 2017

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1 Summary information

This PAMGuard Maintenance project has run between October 2014 and March 2017. The following report outlines the major developments to the code, the new releases of the software, the download statistics and the publication history. Agreed work for this period fell into six main categories:

1. Support to Users and Developers
2. Fixing of Bugs in the code identified by users
3. Updating the code to support full 64 bit functionality
4. Improving Target Motion Analysis functionality
5. Separating modules into separate plug-in modules
6. Development of an improved funding stream through a system of voluntary contributions

Work has now been completed in all of these areas. Each is detailed in a section below.



2 Major code developments

2.1 Database, Java 8 and 64 bit support

2.1.1 Database

From its early days, PAMGuard has always supported two different database storage options, namely Microsoft Access and MySQL (<https://www.mysql.com/>). MySQL is complicated to set up and administer on a computer so to the best of our knowledge, nearly all users used a Microsoft Access Database. Unfortunately, the interface between Java (the PAMGuard programming language) and Microsoft Access was never supported for 64 bit Java versions and support has been withdrawn completely from Java 8 and all future Java versions.

A major piece of work was undertaken in 2015 to either identify an alternative interface to MS Access or to find an entirely different database which could be used in its place. Investigation made it increasingly clear that there is unlikely to be a suitable MS Access database interface which is compatible with both Java 8 and 64 bit Java in the near future. Some commercial solutions are available, but these are expensive with licenses typically costing \$100 per user per year. This option has not been pursued since it would be incompatible with the open source nature of PAMGuard. An open source interface to MS Access is available in the form of UCanAccess. However, testing indicated that this is not currently stable enough for real time use and it's very unclear how well this system, which is basically a hack directly into the Access files, will support future Access versions. Instead an alternative database has been provided – SQLite (<https://www.sqlite.org/>) which like Access creates a single file on the users computer which can be easily backed up and copied at the end of a cruise. SQLite is free to use and a number of free implementations are available. Functions to import and export and import data between SQLite and MS Access using the UCanAccess driver have been implemented in PAMGuard in order that users can continue to work with old data. This was released in version Beta 1.14.00 at the end of September 2015. Matlab code has also been provided through the PAMGuard facebook page for people who require a connection to SQLite databases from Matlab. It is still possible that an improved interface to Access databases will become available in the future and we will continue to monitor the situation in the hope of reinstating Access support in the future. At the time of writing, nothing has become available.

To date, we have had no negative feedback concerning SQLite databases.



2.1.2 C libraries

While the PAMGuard core code is all written in Java and will run with a 32 or 64 bit version of Java, PAMGuard is reliant on a number of C language libraries for interfacing to external hardware such as ASIO sound cards, National Instruments Acquisition devices, Measurement Computing Devices (used for depth measurement) Serial Ports, etc. Code for these libraries has been rebuilt for 64 bit operation.

2.1.3 Java 8 / 64 bit installers

On completion of the two tasks above – providing a 64 bit compatible database solution and a suite of interface libraries to external hardware, PAMGuard installers were created which allow the installation of either 64 or 32 bit PAMGuard versions. If users are determined to continue to use MS Access they are able to install Java V 7 on their computer and run the 32 bit PAMGuard version and the old MS Access interface will still work. If working with Java 8 or a 64 bit Java version, then it is possible to import data form older MS Access databases.

2.2 Target Motion Tracking

Considerable work on improved target motion tracking in PAMGuard has been conducted by Douglas Gillespie and Jamie Macaulay. Features of the new tracking software include:

1. A merging of the structures and database interfaces used for online tracking and offline tracking. This means that tracks and localisations made during real time operations are now available in the PAMGuard viewer either for checking of for continued analysis.
2. A choice of 2D and 3D localisation algorithms is available to the user.
3. Improved error analysis and reporting is being developed both for display on the map and logging to the database.

Users of the Click Detector will notice the following changes:

1. There is now a choice of least squares and Simplex based algorithms for real-time animal tracking. The improved algorithms also provide better error information both for display on the map and for storage in the database.
2. A number of user options are now available for automatic click train identification and tracking. Improved options are available to the user, via the click detector bearing time display, to correct and relabel clicks / entire click trains.
3. The automatic click train identification is now using the same internal structures as the manual tracking, so it's possible to combine automatic and manual tracking. Furthermore, the number of data streams associated with the click detector has been tidied up so that there are a) All Click, b) Tracked Clicks (those which are part of an event) and c) Events. Online and offline tracking also now use the same database tables. Meaning than when reviewing data offline, the tracks created in real time are now available for review and further analysis.

2.3 Plug-in Management

Work was undertaken during to implement the plugins system described in our proposal for this section of work. This work is now complete and a plug in system is now fully functional. This allows third party developers to distribute PAMGuard modules separately from the core program. A major benefit of this is that modules which have very little use to any but a select group of users and may be either unreliable or poorly documented no longer have to be distributed as part of main PAMGuard releases. We have also extended the functionality to code controlling sound acquisition devices. Rather than having an increasingly cluttered list of acquisition systems, the PAMGuard interface for these systems can now be distributed by device manufacturers. These features have been released with Version 1.15.09.

3 User and Developer Support

On average, 45 emails were exchanged with users requiring support each quarter. Normally several emails would be exchanged in each support “conversation”, the number of emails per conversations being typically around 4.

Developers working on an improved version of the ROCCA whistle classifier, the DIFAR localisation module was provided over the two year period. We also assisted three different developers interfacing hardware into the PAMGuard acquisition module. One of these interfaces is being used by that hardware manufacturer in the form of a plug in module. Since the associated hardware is not publically available, we will not incorporate that acquisition system in the PAMGuard core. Despite having provided assistance to the other developers, to the best of our knowledge, nothing has been created which is yet of use within PAMGuard.

4 Releases

Over the course of the current PAMGuard Maintenance project there have been 16 new releases of the PAMGuard code. These are summarised below. Full release notes can be found here for the most recent release: http://www.pamguard.org/57_ReleaseNotes.html and here for the older releases: http://www.pamguard.org/58_OlderReleases.html

Release	Date	Release Notes
1.13.00	Dec 2014	The new version is packed with great new features including ten new modules as well as several improvements to existing modules and bug fixes.



1.13.01	Jan 2015	3 bugs fixed
1.13.02	Jan 2015	1 bug fixed
1.13.03	Mar 2015	Small changes have been made to the ROCCA whistle classifier module: Added Sampling Rate, Number of Channels and Geographic Location to the Rocca contour output file. Number of Channels and Geographic Location can be specified by the user in the Rocca Parameters dialog Notes tab. 7 bugs fixed.
1.13.04	Jun 2015	Changes include: Spectrogram annotation marks, A new system for important warning messages, File and Folder audio input systems, The sound File and Folder audio input systems, The Open Office Database system has been removed from the list of available options, Changed Rocca Measurement menu item and the DIFAR module has received numerous improvements and bugfixes after 6 weeks of field testing. 8 bugs fixed.
1.13.05	Jul 2015	Improved options for plotting clicks on the map in viewer mode. 9 bugs fixed.
1.14.00	Sep 2015	The format of configuration files has changed for version 1.14.00. An alternative database interface has been provided in the form of SQLite which has been extensively tested with all PAMGuard modules. Other changes include Module settings import, Click classification settings export / import, GPS Loading into PAMGuard Viewer and Sound Trap tools module. 7 bugs fixed.
1.15.00	Feb 2016	This is the first release of a 64 bit version of PAMGuard. Other changes include Updated the configuration file WMM.COF for World Magnetic Model and Small changes to the ROCCA classification module. 5 bugs fixed.
1.15.02	Mar 2016	5 bugs fixed
1.15.03	Apr 2016	Fixes to a pair of bugs concerning import from Access databases to SQLite.
1.15.04	Jul 2016	A number of bug fixes and code improvements have been made. 11 bugs fixed.
1.15.05	Sep 2016	A major piece of work has been undertaken to improve the Target Motion tracking with PAMGuard. 4 bug fixes.
1.15.06	Nov 2016	This release contains bug fixes from release 1.15.05, mostly concerning the new target motion analysis methods. 10 bugs fixed.
1.15.07	Nov 2016	2 bug fixes
1.15.08	Nov 2016	1 bug fixed
1.15.09	Jan 2017	A major change in this version of PAMGuard is how plug-ins are managed. The installer has been updated to handle both 64 bit and 32 bit installations. 1 bug fix.
1.15.10	Mar 2017	7 bug fixes

5 Publications

The PAMGuard publication (Gillespie et al., 2008) has been cited a total of 67 times in the published literature. Of these, five publications have been released between 2014 and 2017:

- Macaulay, J., Gordon, J., Gillespie, D., Malinka, C. and Northridge, S., 2017. Passive acoustic methods for fine-scale tracking of harbour porpoises in tidal rapids. *The Journal of the Acoustical Society of America*, 141(2), pp.1120-1132.
- Rankin, S., Archer, F., Keating, J.L., Oswald, J.N., Oswald, M., Curtis, A. and Barlow, J., 2016. Acoustic classification of dolphins in the California Current using whistles, echolocation clicks, and burst pulses. *Marine Mammal Science*. 33(2) pp.520-540.
- Keating, J.L., Barlow, J. and Rankin, S., 2016. Shifts in frequency-modulated pulses recorded during an encounter with Blainville's beaked whales (*Mesoplodon densirostris*). *The Journal of the Acoustical Society of America*, 140(2), pp.EL166-EL171.
- Nichols, N.M., 2016. Marine mammal species detection and classification (Doctoral dissertation).
- Barkley, Y., Barlow, J., Rankin, S., D'Spain, G. and Oleson, E., 2016. Development and Testing of Two Towed Volumetric Hydrophone Array Prototypes to Improve Localization Accuracy During Shipboard Line-transect Cetacean Surveys.

6 Conferences etc.

6.1 Workshop: improved standards for PAM monitoring

Douglas Gillespie attended a one week workshop at The SCRIPPS Research Institute to discuss improved standards for PAM monitoring. The meeting was organised jointly by Dr Aaron Thode of SCRIPPS and The UK's Joint Nature Conservation Committee which acts as an adviser to the UK government and develops guidelines for mitigation monitoring for offshore activities. A number of possible future PAMGuard activities came out of the meeting including improved ways of measuring noise so that rapid assessments of PAM operational efficiency can be derived, a calibration module to assist less expert users with system calibration and systems for improved reporting to the regulators. Dr Marie Roch also presented the Tethys Database system (<http://tethys.sdsu.edu/>) developed for data management within the SCRIPPS Whale Acoustic Lab. In the coming months we will analyse whether or not this database system could be incorporated into PAMGuard, the additional functionality it would bring, how useful that would be and the cost of integration. Gillespie's flights and T&S were funded by JNCC.

6.2 Conference: Effects of noise on aquatic life

Rachael and Doug submitted an abstract which was accepted for a poster presentation at the conference “Effects of noise on aquatic life” in Dublin, July 2016. This poster advertised the PAMGuard software and the maintenance and voluntary contribution system. Below are copies of the abstract submitted and the poster presented:

The Maintenance of PAMGuard Software to Detect, Localize, and Classify Marine Mammals

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Passive acoustic monitoring (PAM) is widely used as a tool in the mitigation of the potential effects of underwater sound on marine mammals. Marine mammal vocalizations vary enormously in frequency and duration from the 10- to 15-Hz, 15-s duration moans of blue whales to the ultrasonic 130-kHz, 100- μ s duration echolocation clicks of porpoises. Different processing algorithms and hardware configurations are required to detect and localize such a diverse range of sound types. Mitigation exercises, by their very nature, also tend to take place in a highly variable noise environment, so a system that allows easy operator intervention and checking of detection results is essential if high rates of false alarm are to be avoided. PAMGuard was created to provide a standard software infrastructure for the detection, classification, and localization (DCL) of marine mammal vocalizations. PAMGuard supports a wide range of sound acquisition devices and multiple channels of data can be processed in real time at sample rates in excess of 500 kS/s. The Java-based software is free to download and is open source, providing a rapid development environment for new DCL algorithms. The software undergoes a continuous process of improvement and bug fixing to ensure compatibility with new versions of Windows, Java, and external hardware. In addition, we support other PAMGuard developers around the world. To date, maintenance and support for PAMGuard has been provided through direct exploration and production (E&P) industry funding via the International Association of Oil & Gas Producers (IOGP) Sound and Marine Life Joint Industry Programme. Funds are used to provide basic support to industry users, fix any reported bugs, and provide general maintenance. Maintenance funding is now transitioning to a voluntary contribution system that will operate based on payments from the owners of the PAM equipment that employ the PAMGuard software. Currently, these arrangements are being implemented within the oil and gas industry, particularly for seismic surveys, but it is hoped that it will be adopted by other offshore users, including the renewable energy sector, in the near future. Examples of recent maintenance activities are the provision of a new database interface and Java 8- and 64-bit compatible software versions. We are also working to alter the plug-in architecture, making it easier for developers to distribute bespoke modules. An improved real-time target motion localization module will also be released later this year. Additional information is available at www.pamguard.org.



PAMGuard Software to Detect, Classify and Localise Marine Mammals

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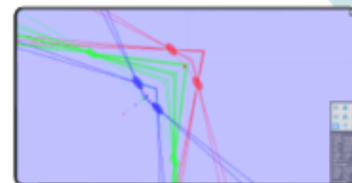
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Industry standard software for acoustic detection, classification and localisation of vocalising marine mammals. Advanced signal processing algorithms working with a flexible user interface for human validation and rapid real time decision making.

PAMGuard is **free** and is **open source**, providing a rapid development environment for new detection, classification and localisation algorithms.

- Up to 32 channels of audio data
- Works with towed or static hydrophone systems
- Sample rates in excess of 500kS/s
- 53 User configurable modules for sound processing, detection, localisation, classification and display of data
- Detectors for many different sound types such as echolocation clicks, dolphin whistles and baleen whale calls
- Modules for mapping and visual data
- Offline data visualization and further analysis



Map output of target motion analysis module to track sperm whales. Localisation errors are shown as ellipses to accurately reflect localisation errors in a manner that is easy for PAM operators to understand.



PAMGuard also contains modules for visual data collection. In this example, Photogrammetric methods are being used to visually localize dolphins.

Recent Development Activity

- **New localisation methods** allowing multiple widely separated hydrophones to locate individual calls.
- **New graphics and more advanced algorithms** to provide a more intuitive representation of localisation errors.
- **New database interface** to support SQLite databases and support for latest 64 bit Java versions.

Maintenance and Support

The software undergoes continuous improvement and bug fixing and support is provided to both users and developers. PAMGuard is maintained by specialists at the University of St Andrews, funded by the IOGP Sound and Marine Life JIP. This is now transitioning to a voluntary contribution system which is currently supported by a number of PAM equipment providers.

Recently, funds have provided a new database interface and Java 8 and 64 bit compatible software versions. We are working to alter the plug-in architecture, making it easier for developers to distribute bespoke modules.



Key to successful PAM operations is a flexible user interface which allows the operator to check detections in real time. This is achieved through standard acoustic displays such as the spectrogram as well as detection mapping and detector specific displays.

OPEN SOURCE SOFTWARE FOR PASSIVE ACOUSTIC MONITORING



Acknowledgments: We are grateful to the IOGP Sound and Marine Life Joint Industry Programme for funding this work and to the companies that have signed up to the voluntary contribution system: CSA Ocean Sciences Inc., MGS Ltd., SA Instrumentation Ltd., Seiche Ltd. & SMRU Consulting.



7 Voluntary Contribution System

One of the initial tasks outlined in the contract was the development of a self-funding mechanism. This process involved the production of a Scoping Document which outlined potential funding development options and ways to generate money from open-source software. This was followed up by a total of 6 forums. Details of the contribution system can be found here: http://www.pamguard.org/38_VoluntaryContributions.html

The self-funding mechanism will be operated through user Contribution. Funds are used by the PAMGuard team to provide basic support to industry users, fix any reported bugs and to provide general maintenance (for instance, ensuring compatibility with new Windows and Java versions).

We expect to receive contributions from owners of PAM equipment that employs the PAMGuard software to detect, classify and localize marine life. Consultation with PAM stakeholders, suggest this will maximise the potential of receiving contributions from multiple E&P activities, across geographic regions being conducted by multiple companies.

To date we have collected contributions from three companies: Seiche, MSeis and Vanishing Point. The contributing companies confirmed they would like to receive quarterly reports on the days used and tasks completed, after which a contributors forum will be held. There are currently sufficient funds to continue PAMGuard Maintenance for the rest of 2017 based on additional funding sources to maintain staff contracts, low levels of user support and non-urgent bug fixes.

8 Acknowledgements

We would like to thank Chloe Malinka and Victoria Warren for their work conducted testing the PAMGuard software prior to new releases.

Appendix 1: Downloads

The web stats show a total of 17,828 downloads of PAMGuard software between 1st October 2014 and 31st March 2017.

Activity Reports

Download Name	Downloads
Activity Report Oct to Dec 2016	13
Activity Report Jul to Sep 2016	8
Activity Report April to June 2016	66
Activity Report January to March 2016	163

Activity Report June 2012 to January 2013	46
Activity Report October to December 2015	518
Activity Report July to September 2015	420
Activity Report April to June 2015	95
Activity Report January to March 2015	70
Activity Report October to December 2014	62
Activity Report February 2012	579
Activity Report March - April 2012	240
Activity Report May - June 2012	238
Activity Report June to December 2012	1080

General Configuration Files

Download Name	Downloads
DIFAR Configuration	372
Sperm Whale Click and Dolphin Whistle Detection	672
Sperm Whale Click Detection	550
Porpoise Click Detection	696

Likelihood Detector Configuration Files

Download Name	Downloads
Sperm Whale	419
Humpback	434
Bowhead Whales	394
Beaked Whale	444
Readme File	664

PAMGuard Software

Download Name	Total
1.15.10 32 and 64 Bit	58
1.15.09 32 and 64 Bit	375
1.15.08 32 and 64 Bit	1780
1.15.07 32 and 64 Bit	646
1.15.06 32 and 64 Bit	48
1.15.05 32 and 64 Bit	469

1.15.04 32 and 64 Bit	1566
1.15.03 Core 32 Bit	977
1.15.03 Beta 64 Bit	2859
1.15.02 Core 32 Bit	59
1.15.02 Beta 64 Bit	111
1.15.00 Beta 64 Bit	2981
1.50.00 Core 32 Bit	221
1.14.00 Beta	1264
1.13.05 Beta	554
1.13.04 Beta	178
1.13.03 Beta	509
1.13.02 Beta	295
1.13.01 Beta	19
1.13.00 Beta	475
1.12.06 Beta	82
1.12.05 Beta	1999
1.06 Core	184
Beta 1.10.00	119

Publications

Download Name	Downloads
Consultancy: Modification to Data Identification	69
Free PAM software to improve marine mammal detection	568
A quick guide to PAMGuard	1222
Free PAM software to improve marine mammal detection	535
PAMGUARD: Open Source Software For Real-time Acoustic Detection and Localisation of Cetaceans	1592
Pamguard: Semiautomated, open source software for real-time acoustic detection and localisation of cetaceans	1079

ROCCA Configuration Files

Download Name	Downloads
ETP Species Classifier	384

Details of registration information from the download pages are as follows:



Industry	Downloads
Oil & Gas	885
Civil Engineering	93
Offshore Wind	83
Tidal and Wave Energy	33
Academic Research	1790
Other	863
Rather Not Say	192
Operation	Downloads
Real time mitigation	1167
Abundance Estimation	594
Behavioural Research	804
Other	1094
Rather Not Say	263
Geographic	Downloads
US	772
Europe	1769
Africa	174
Australasia	174
Asia	199
Other	661
Rather Not Say	202
Location	Downloads
Global	827
US	598
Europe	1217
Africa	151
Australasia	146
Asia	188
Other	612
Rather Not Say	214

Appendix 2: Bug Fixes

8.1 Release 1.13.00

- Reading of wav files. Modifications to the Java wav file reading code in order to read wav files between 2 and 4 GByte in size (the wav standard extends to 4 Gbyte, but Java for some reason only supports up to 2Gbyte)
- Ishmael Detector configuration. It was impossible to correctly configure these detectors and configuration settings were not being saved correctly. This has now been rectified.
- Logger forms input of character data. Was causing an exception when character input fields were cleared.
- Click detector inter click interval display was not working in viewer mode. This has been rectified.
- Configuration loading. This has been rationalised since it was often confusing to users. It is now no longer possible to change configurations once PAMGuard has been launched and pressing 'Cancel' on the select dialog causes PAMGuard to exit.
- Airgun display. If this was included in the PAMGuard model before the GPS module it would hang PAMGuard. This has been rectified.
- Fixed occasional exceptions in the sound output modules when playing back from files.
- Fixed exceptions in spectrogram user interface.
- Fixed National Instruments sound output bug which meant that it could only work with two channel data. Will now work with one to as many channels are supported by the playback device.
- Fixed colour bugs in Logger forms which did not display correctly in "night" mode.
- Bug fix in simulator. No longer stops or fails to start generating sounds.
- Bug in calculated spectrum levels if data were decimated (<http://sourceforge.net/p/pamguard/bugs/187/>). Did not affect band level calculations.
- Bug in noise band monitor. Crashed when sample rate was exactly 2kHz. Fixed
- Memory leak in click detector. Severe memory leak when processing clicks in viewer mode now fixed.
- Flickering of click display (<http://sourceforge.net/p/pamguard/bugs/191/>) now fixed.
- Logger forms crashing in Viewer mode. Bug now fixed.
- Storage options (<https://sourceforge.net/p/pamguard/bugs/175/>) whereby clicks were stored to database is now fixed.
- Sound Recorder output folder is now defaulting to the User folder (Generally C:/Users/username/PAMRecordings) instead of C:/Program Files (x86)/PamguardBeta which didn't work since the software doesn't have write access to that folder.

8.2 Release 1.13.01

Bug 207. Threading hydrophone error. Caused array location errors if GPS data set to read on a time. Fixed

Bug 205. Crash in 3D localiser if no output CSV file set.

Bug 197. Click detector reporting "Null Click with no waveform". Fixed

8.3 Release 1.13.02

Bug 208. Logger forms CHECKBOX control crashes. Fixed.

8.4 Release 1.13.03

Bug 209. Map zoom level. This was zoomed right into a range of about 1m when new maps were created. This is now fixed and it starts with a default range of 10km on the display.

Bug 212. Decimator crashed. This only happened very rarely and only if a very large decimation factor was used, so it's unlikely to have affected anyone.

Bug 215. Sound acquisition dialog crashing. Could happen if there were no sound cards installed on a system.

Bug 216. Whistle classifier would not work offline (in viewer mode). This is now fixed.

Bug 217. PAMGuard viewer fails to read a configuration at startup. This would cause total loss of the PAMGuard configuration in viewer mode and has been rectified.

Bug 218. SAIL Acquisition card would hang the system. This has also been fixed.

Bug 219. Problems displaying Offline Click Events in the Viewer map have been fixed.

8.5 Release 1.13.04

Bug 220 Sample counts were wrapping and causing PAMGuard to report incorrect times after 2^{31} samples.

Bug 223. Click detector null clicks (This primarily only affected offline file analysis).

Bug 225. Display of remaining recording time. Was only displaying hours, minutes and seconds. Now correctly displays the number of remaining days.

Bug 226. Spectrogram Mark Observer list doesn't refresh when modules added or removed.

Bug 227. Logger forms not working with MySQL. Several minor issues with the MySQL interface generally and in particular with the logger forms module have been resolved.

Bug 228. Occasional crashing when training the whistle classifier.

Bug 229. Fixed bug in Viewer Mode which caused Rocca to crash when analyzing click event containing unclassified clicks

Bug 230. Click Bearing Display. With a two hydrophone system, clicks calculated to have a bearing of exactly 180 degrees would be displayed at 0 degrees on the bearing time display.

8.6 Release 1.13.05

Bug 231. PAMGuard freezing when starting viewer mode. (Caused by an infinite loop in the map module). Fixed.

Bug 232. Incorrect click length calculation in ROCCA module. Fixed.

Bug 233. ROCCA not analysing correct clicks in Viewer mode. Fixed.

Bug 234. Hydrophone import of .paf files crashing. Fixed.

Bug 235. Target motion analyser crashes when changing default bearing line length. Fixed.

Bug 236. Whistle classifier crashing during batch training just prior to writing results files. Fixed.

Bug 237. Logger forms not saving data to database after sound acquisition starts. Fixed.

Bug 238. Viewer mode out of memory error. Have adjusted memory allocation to allow more memory for the database interface. Hopefully Fixed.

Bug 239. Fixed bug in the DIFAR module that was incorrectly preventing cross-fixes for some calls.

8.7 Release 1.14.00

Bug 246. AIS Data Unpacking. Bug in AIS data unpacker fixed.

Bug 247. Fixed Landmark display. Landmarks were not displaying in the viewer. This is now fixed.

Bug 248. Crash in hydrophone array manager. Bug in array manager would crash PAMGuard when the click detector was configured with more channels than the sound acquisition system (almost impossible to achieve, but someone managed it).

Bug 249. Corrected bugs in Rocca analysis of click events.

Bug 250. DIFAR module was crashing if it attempted to triangulate between more than two simultaneous bearings. Fixed.

Bug 251. Fixed error in DIFAR intensity calculation.

Bug 252. Bug which plotted bearings to whistle and moan detections from the front hydrophone rather than the central position between hydrophones now fixed.

8.8 Release 1.15.00

Bug 253. Database import fails when Access database contains queries. Fixed.

Bug 254. Lookup lists failing in imported SQLite databases. This was caused by the system "padding" topic's with blank spaces and is now fixed.

Bug 256. Map not updating. Graphics updating was only happening when new GPS data arrived and therefore didn't update when using static hydrophones. Fixed so that graphics update correctly.

Bug Sound recorder missing a few samples between files. The sound recorder wav file output system has been rewritten in a much simpler form and now won't lose samples between consecutive files when new files are started automatically. It will also start new files on integer second or minute boundaries when file durations are set to a maximum fixed value.

Bug 262. Access to SQLite database conversion. This would fail when tables were present which were not created by PAMGuard. Fixes have been put in place for spaces in the table name or for not having an "Id" column. Fixes have not been implemented for spaces in a column name or use of a reserved word as a column name, however if either of these problems do exist it will no longer crash but issue a clear warning and carry onto the next table.

8.9 Release 1.15.02

Bug 266. Clip generator crashed in viewer when the path for output files was not defined even if files were not being created. Fixed.

Bug 267. Click detector not calculating correct bearings when multiple hydrophone pairs with different separations were used. Fixed.

Bug 268. ROCCA module was not saving WAV file clips. Fixed.

Bug 269. Whistle and Moan detector paired bearing localiser was not working. This localizer searches for matching whistles on pairs of hydrophones. Bearings from each pair are crossed to create a localization. Fixed.

Bug 270. Improved file names display in Pamguard Viewer offline data map and datagram creation.

8.10 Release 1.15.03

Bug 271. Problem 1 was that the incorrect settings were being imported into the new database. Problem 2 was that indexing of imported click events in the new database was incorrect. Both these issues have now been fixed.

8.11 Release 1.15.04

Bug 272. File types: Some File Open / File Save dialogs were allowing selection of all file types. e.g. Save Configuration As, Section of whistle classifier training file, Map file Selection, These have now been changed so that only the correct type of file can be selected.

Bug 274. GPS Memory leak. A Memory leak associated with GPS data collection has been found which could cause PAMGuard to run out of memory after a day or two's operation. This has now been fixed.

Bug 275. Painting of thumbnail on the Map display time slider. Have fixed a small problem in the graphical display. The visibility of components on this slider has also been improved and a log time scale option is available to facilitate in map data display.

Bug 276. The default hydrophone sensitivity was -201dB re 1V/uPa. This was supposed to be used with a default preamp gain of 30dB. For some reason gain was no longer being added. We have therefore set a default sensitivity of -170dB and left gain at zero. This is more typical of many hydrophones in use today.

Bug 277. Text fields in classifier dialog were not large enough to display times greater than 10ms. We have increased length of text fields in the dialog.

Bug 278. Have future proofed against potential binary file format changes in future releases. New PAMGuard releases will always be able to open older binary files, however, with previous PAMGuard releases if a newer file format was opened, then PAMGuard was unable to check that the file format was newer and would attempt to read the files and might even corrupt them. Now it will recognise that it cannot open the files, display appropriate error messages and not attempt to read the files. NOTE that at this time there are no planned file format changes and that this is purely a future proofing exercise.

Bug 279. GUI Resizing: The whole PAMGuard GUI would suddenly resize to something very small when a dialog is opened. This has been traced to improper use of a common dialog component SourcePanel which tries to repack its parent Window. Some programmers had inadvertently set it to repack the main PAMGuard GUI instead. This has been Fixed.

Bug 280. Recorder control option to automatically restart recording were causing confusion. It was working in that the recorder would return to its previous state, but it was sometimes difficult for users to set it so that



recording would always start as soon as PAMGuard started. More sensible and easy to understand options have been developed in a new options dialog.

Bug 281. Click classification dialog has grown too big to fit on the screen. The options have now been split across three tabbed panes which solves the problem.

Bug 282. Quiet clicks causing too many false classifications. An additional option has been added to the click classifier to limit a class to a range of amplitude.

Bug 283. The spectrogram display was not displaying data in Viewer mode. This has been traced to a problem in offline data mapping and has been fixed.

8.12 Release 1.15.05

Bug 273. Sound files in viewer data map. These were not being correctly catalogues in the datamap when using the PAMGuard viewer which meant that PAMGuard was not correctly loading sound data during offline analysis. This is now fixed.

Bug 287. Slow database. This has been solved by setting the default behavior of the database to have Auto Commit set to 'off'

Bug 288. Fixed problem of missing help file image

Bug 290. Click bearings on spectrogram display plug in were reversed if the first hydrophone was behind the second hydrophone in the configuration. This is now fixed so that it displays the same bearings as the main click detector display.

8.13 Release 1.15.06

Bug 291. Click Detector Click Classifier: If this is set to "none" the click detector will freeze / crash and will put the psf file into a state where it will never load again. Incredibly, this bug seems to have been in place for several years and no one has come across it until now. It's fixed.

Bug 292. Incorrect labels on Target Motion panel in viewer - 3D algorithm was labelled as 2D.Fixed

Bug 293. Errors displayed in the click detector target motion panel were wrong in the graphics for the Simplex localisers and wrong in the tabulated data for the least square model. Both fixed.

Bug 294. Click classifier was crashing when the "min amplitude" option was used. This is fixed.

Bug 295. If a click has a total length of a single sample, the code attempting to estimate the time delay between channels would crash. This is now fixed. This could only occur if both pre sample and post sample were set to 0 in the click detector, which is generally not a good idea, so this bug may have been there for some time, it's just that no one noticed before. Fixed

Bug 296. Context menu popping up in click detector when marking clicks in Viewer mode. This has been fixed so that in viewer mode, the menu will only appear when you right click on the display.

Bug 297. Airgun display was not correctly showing itself at fixed locations, but always following the vessel track. This is now fixed.

Bug 299. Threading Hydrophone locator. Bug found in hydrophone heading calculation has been fixed.

Bug 300. GUI Tab panel selections were not being restored correctly when PAMGuard displays were split across multiple frames. Fixed.

Bug 301. Multiple errors in the target motion module have been fixed.

Bug 302. Target motion calculations taking too long when many clicks are included in a track. Mostly a problem when using automatic click train id. Fixed by setting an optional maximum number of clicks to use in a track.

8.14 Release 1.15.07

Bug 303. Some ASIO sound cards not working with either ASIO system in PAMGuard. For the PAMGuard ASIO system, this was due to a data format used by some sound cards never being properly implemented. For the "New ASIO system" which is based on JAsioHost, the unpacking of that format contained a bug which returned incorrect numbers, so data were swamped with noise. Both systems are now fixed. By preference, users should use the PAMGuard ASIO system since the JAsioHost based system seems to drop samples when many channels are running at high sample rate.

Bug 305. Date and Time not being correctly extracted from wav files created using SoundTrap recorders. Fixed by correctly finding and unpacking information in the accompanying xml log files that come with SoundTrap files.

8.15 Release 1.15.08

Bug fix 305 introduced a different bug, so decoding file times of non-sound trap files stopped working. This is now also fixed.

8.16 Release 1.15.09

Bug 306. Certain methods have been querying `AcousticDataUnit.getDuration` and expecting to receive a response in milliseconds. However, `getDuration` actually returns the number of samples. This has been corrected.

8.17 Release 1.15.10

Bug 308. Map Overlay Control. Storage of data saying what gets plotted on each map and for how long became corrupted and the list grew to a ridiculous size. Code has been put in place to a) stop it happening again and b) to repair any configuration files which are corrupted. Corrupted files will be slow to load, slow to save and will be > several megabytes in size. It may be necessary to delete the `PamguardSettings` table in any databases since these too may have become oversized which will slow down viewer mode PAMGuard start-up.

Bug 309. Rocca would crash when the user would press the classify button after the contour was recalculated. This has been corrected.

Bug 310. When exiting Viewer mode, PAMGuard queries the user whether they are sure they want to exit without saving even though they selected *Save and Exit*. Corrected, and added an *Exit without Save* option.

Bug 311. When double-clicking on a psf file to start PAMGuard, the working directory is set as the location of the psf and not as the installation folder. The library subfolder (`\lib` or `\lib64`) uses a relative path from the working folder, and therefore is set incorrectly. This has been fixed.

Bug 314. If PAMGuard is started by double-clicking on a psf, nothing happens when the user selects save as new configuration. This has been fixed.

Bug 315. Code searched for file in working folder, which is the installation folder when starting PAMGuard using a shortcut link. But when double-clicking on a psf, the working folder is the location of the psf. This has been fixed.

Bug 316. Another error reading metadata for Dtag and SoundTrap files has occurred due to a format change in dTag metadata. This has been fixed.