

Proposal for Funding made to:

Atlantic Coastal Cooperative Statistics Program  
Operations and Advisory Committees  
1050 N. Highland Street, Suite 200 A-N  
Arlington, VA 22204

Rhode Island Department of Environmental Management Proposal:  
Voice Recognition using Dragon Speech within Dockside Interceptor Application (DIA)

Submitted by:

Rhode Island Department of Environmental Management  
Fish and Wildlife Division  
235 Promenade Street  
Providence, RI 02908

Applicant Name:	Rhode Island Department of Environmental Management Division of Fish and Wildlife.
Project Title:	Voice Recognition using Dragon Speech within Dockside Interceptor Application (DIA).
Project Type:	New Project (second year)
Principal Investigators:	Mike Bucko, RI DEM
Requested Award Amount:	\$60,540.80
Requested Award Period:	One year upon receipt of funds
Original Date Submitted	June 10, 2019

## Objective:

This project proposal, Voice Recognition using Dragon Speech within Dockside Interceptor Application (DIA), is a follow-up project focused on integrating voice to text capability into the Dockside Interviewer Application tablets, extending functionality developed during 2019 to prototype speech recognition. The goal of this project is to develop, test, and implement a hands-free voice recognition data recording module to be utilized in the field by ACCSP Fisheries Technicians to record type 3\* and type 9\*\* catch data. The module will be added into the Dockside Reporter tablet application (DIA) already in use on the Atlantic Coast.

The existing project focused on creating and using the native speech recognition capabilities in Android and Windows. The native speech recognition capabilities for these platforms both require an active internet connection, which is problematic while sampling off shore. The project has incorporated changes to the Dockside Reporter application to the design of type nine and type three data collection to accommodate integration of speech recognition into the application. The result of the project thus far has been positive and has been demonstrated that this functionality can be added into the DIA. This project “Voice Recognition to Text” represents an inexpensive approach to using an electronic fish board. The original android prototype dockside reporting application originally had the capability to connect with an electronic fish board, this utility was abandoned because of both cost and functionality issues.

However, the existing project has highlighted limitations in the native Google and Windows cloud-based speech recognition technologies in addition to the requirement of a reliable network connection. These technologies suffer from latencies sending data back and forth across the internet, and the tools available to optimize recognition results are still immature and not adequate for handling the specialized vocabularies found in a fisheries data collection application. While the existing effort has been valuable for prototyping application design, it is inadequate for deployment in real-world data collection environments outside the range of WIFI or cellular data connections.

This new proposal builds upon the results of the 2019 project. The Windows prototype from the 2019 project was based on the Android implementation and was ported with just enough functionality to test the speech recognition. This application will be fully completed to be feature equivalent with the Android release and will have Nuance Dragon speech recognition software integrated into the application. The Dragon software is only available on Windows but implements speech recognition directly on the PC running the application and does not need an internet connection. Additionally, the Dragon software contains utilities to improve speech recognition accuracy and performance, such as training for speaker-dependent recognition and the creation of custom vocabularies to handle tasks such as recognizing the hundreds of potential species names might be spoken into the application.

*\*Type 3 data described by APAIS protocols is lengths and weights of available individual catch (whole fish)*

*\*\*Type 9 data described by APAIS protocols is the observed and unobserved lengths of discarded whole fish caught on head boats*

**Need:**

Using technology that uses speech recognition for direct data input while handling fish sampled on a head boat holds the potential to greatly increase the efficiency and accuracy of the fishery technician in the field. A hands-free data recording utility would allow the fishery technician to measure fish faster than current keyboard entry systems or requiring the user to tap a screen to select items from lists. This increase in efficiency would allow for more interviews to be completed on head boat trips which in turn would result in more type 9 biological samples of recreational discards. This increased efficiency would allow the fishery technician to focus on the task of identifying and measuring the fish and thus increase both the accuracy and precision of the length data being collected. Furthermore, beyond this specific project, the increased use of speech recognition technology would have value in other data collection applications and could be applied to many fishery dependent and independent sampling programs.

The existing speech recognition technology requires a connection to a cellular signal which is not always available while sampling at sea onboard headboats. Therefore, alternate technology is required which can perform recognition using only the hardware in the mobile device such as a tablet.

Prototyping existing network-based speech recognition technologies has indicated that recognition accuracy is not robust enough to deploy with actual users in real world fishing environments. The Dragon software contains utilities that can greatly increase the efficiency of the hands-free process by eliminating the need to work through translation errors.

**Approach:**

The approach to this plan makes several (dependent) assumptions:

- The ACCSP continues to develop its Dockside Interceptor Application (DIA).
- The application programming interface (API) developed during that project is further modified, if necessary, to facilitate data collected from the project.
- All software enhancements to the ACCSP Dockside Validation tool developed under this proposal will be done in conjunction with the ACCSP, and the source code will belong to the ACCSP for future modifications, enhancements, or license by the ACCSP if desired. The software will be available for use by all partners.

**Task 1:** Test a voice recognition program to record data input from a Bluetooth microphone without a connection to the internet into the current Dockside Interceptor Application (DIA). The MS Windows Surface Go tablet will be the platform used to integrate Dragon Speech software into the DIA.

The project proposes to use existing ACCSP tablet-based reporting software (DIA) already in use for the MRIP APAIS. The DIA is currently used in collecting APAIS data from GA to ME. The design of the type 3 and type 9 interfaces took into consideration the addition of voice to text capability during the first phase of the project. The Android platform is currently being ported to the MS Windows platform with additional voice to text testing using Windows Speech Services technology used in the Windows 10 “Cortana” voice to text feature.

The existing prototype software design within the DIA that can process voice to text data inputted via a Bluetooth microphone will be enhanced to use the Dragon technology on Windows instead of the Google or Cortana prototyped implementations. Custom vocabularies will be created for use by fisheries technicians in the field on actual head boat trips.

The enhanced application and “voice to text” functionality will be tested on board the RIDMF R/V John H Chafee during the initial phases. Observers will ride along with the trawl survey to test the functionality of the microphone and recognition accuracy, while recording lengths and weight of fish using both pencil and paper forms for comparison. Two staff will be required to test the application, one will measure the fish and call out the lengths into the Bluetooth microphone while the other will document the lengths of the same fish on a traditional paper form. This approach will eliminate individual sampling bias generated from measuring fish as an error source during testing to allow for better evaluation of the voice to text technology. When satisfied the application is working as intended, it will be tested on board head boats using the same two sampler method as on the R/V Chafee. These trips will not coincide with trips already being sampled for APAIS. If possible, trips onboard head boats from the two major companies in Rhode Island will be used to test the utility of the application and account for different conditions from vessel to vessel, particularly noise levels. Sampling at sea will take place on four half day head boat trips. This sample size should be adequate to determine if the application is functioning as intended.

## **Results and Benefits:**

The first phase of this project identified two major problems with using an open source platform for voice to text translation. Both Google translator and MS Windows Cortana require constant connectivity to the internet to be functional. Additionally, there is inherent lag time between action and reaction due to functioning over the internet. The lack of vocabulary customization has also revealed problems using the two open source platforms. Dragon speech software is currently only offered for MS Windows platforms. Dragon Speech is considered one of the premier products on the market for voice translation. The functionality of Dragon speech solves both issues identified by phase one of the project. It is questionable whether the voice to text type 3 and type 9 data collection would be functional in the field without the work proposed for phase 2.

The original proposal FY18 required constant connectivity to the internet. Each partner would incur a monthly cost for each android tablet, furthermore, some head boat assignments would need Satellite

service to connect offshore. These costs are eliminated by moving to the windows platform which would not need internet connectivity. All the software coding is easily transportable if in the future, Dragon Speech developed standalone product for android.

As of July 2019, funds were available in the original FY18 project to purchase the Dragon Speech software package. We have purchased “Dragon Profession Group 15 (Federal Gov. Package) maintenance and support Package and in doing so have reduced this proposal amount by \$2,169.72.

Although using MS Windows tablets represents a change in the current methodology for using the DIA via Android, it is a much more robust operating system capable of housing a wider range of software such as Dragon speech and would be considered an upgrade to Android. Currently DIA is deployed for MRIP APAIS on Android tablets. The life expectancy of these tablets is likely 3 – 4 years. At that point the Android devices could be replaced with MS Windows tablets with the voice to text capability proposed by this project. Using MS Windows as a platform would not necessarily replace the Android devices as all data is coming into ACCSP via an already developed API capable of accepting data from both sources. Thus, two platforms could be deployed in the field - one for general assignments and one for head boat ride alongs if the cost of the MS Windows tablets are cost prohibitive for coastwide deployment.

#### Geographic Location:

The location and scope of this project would cover all of Rhode Island and adjacent state waters fished by Rhode Island Head boat Captains. The work would be based out of the RIDFW Marine Section located in Jamestown, RI.

**Table 1. Milestone Schedule** (start date dependent upon time of grant award)

Task	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Development and troubleshooting of software for tablet application	X	X	X	X	X	X	X	X	X	X	X	
Field tests at sea R/V Chafee							X	X				
Field Tests on at sea Head boats									X	X	X	
Report Writing												X

## Project Goals and Metrics

1. The DIA functions on Windows tablets using Dragon Speech.
2. Bluetooth microphone linked to MS Windows tablet DIA and voice-to-text data entry is functioning as intended. When activated, speech recognition collected data will go into the appropriate fields.
3. Audible feedback mechanisms will be evaluation validating whether data has been recorded correctly. The audible feedback will help the fisheries technician determine whether the data has been successfully captured for each field utilizing voice to text.
4. Sea trials comparing the DIA voice to text against current methodologies are conducted and error rates are compared.
5. Usability and application design feedback will be collected during trials to iteratively improve the speed and accuracy of data entry using speech.

**Table 2. Cost Summary. Please Note: All related hardware was purchased during phase one of this project.**

Item	ACCSP Share	Partner- in-kind	Total
<b>PERSONNEL COSTS</b>			
RIDEM Personnel John Lake (10% of FTE staff time)		\$6,000	\$6,000
<b>CONTRACT</b>			
Contractor Software Development and Support 353 hours @ \$170/hour	\$60,010		\$60,010
<b>SUPPLIES</b>			
Head Boat Fare 8 trips @ \$50 each	\$400		\$400
Mileage 30 miles @ \$0.545 / mile (8@\$16.35)	\$130.80		\$130.80
Dragon Professional Group 15.0 (Federal Gov Package) Software, Annual Subscription, Maintenance and Support Package (4 Licenses)	\$0		\$0
<b>TOTAL</b>	<b>\$60,540.80</b>	<b>\$6,000</b>	<b>\$66,540.80</b>
<b>Percentage</b>	<b>91%</b>	<b>9%</b>	<b>100%</b>

## **Software D Software Development**

Harbor Light Software, the developers of the Dockside Interceptor application will perform the integration of the Dragon speech technology into the application. Harbor Light Software is the vendor on the existing DIA speech product has developed the existing prototype integration of the Google and Windows speech capabilities.

Harbor Light Software will:

- Add support for the Dragon technology
- Work to incorporate usability feedback from field trials to improve the usability of the speech function
- Make any required modifications to the existing Dockside application to handle any new data reporting requirements necessitated by changes to the APAIS server API
- QA/QC the application before releases
- Manage the deployment of the application to users as required, in conjunction with distribution processes currently employed by the ACCSP
- Provide second-tier technical support for issues found with the application, including correcting errors found in the implementation of the required features

## Summary of Proposal for Ranking Purposes

**Proposal Type:** NEW

**Primary Program Priority:**

**Catch and Effort: 50%** – This project will continue the ongoing work towards the implementation and validation of an ACCSP approved APAIS Program to collect recreational catch data (type 3 and type 9) from Party / Charter and Head boat vessels.

**Data Delivery Plan:**

- All data collected from the ACCSP Dockside Validation tool and all software developed will utilize https protocol for secure data transmission.
- All data transmitted to the ACCSP databases will be sent in accordance with the ACCSP's current published API's supporting this electronic validation solution.

**Project Quality Factors:**

Multi-Partner/Regional impacts

This project is building off previously funded multi-partner/Regional project the APAIS tablet DIA which is doing NOAA MRIP survey. The Regional impact are from States from Georgia to Maine. This proposal would further the utilities of APAIS DIA tablet in collecting recreational biological and harvest data coastwide of TWELVE Partners.

**Greater than year 2 contains funding transition plan and/or justification for continuance**

This last year is a two-year project.

**In-kind contribution:**

RIDFW will **provide 9% in** kind funding derived from 10% of an FTE Biologist's time to implement, evaluate, and report the results of the project (\$6,000).

**Improvement in data quality/quantity/timeliness**

This project will increase data quality/quantity and timeliness by:

- Providing a hands-free data recording system for at sea and dockside measurement of fish which will allow fishery technicians to focus more on the sampling by removing tablet input. The data will be instantly transcribed on the tablet
- The hands-free utility will allow fisheries technician to measure more type 3 and type 9 catches because they will not be spending as much time recording data allowing faster movement between sampling events which will increase quantity of data.

**Potential secondary modules as a by-product:**

- **Biological:25%** This application is designed to enhance the collection of type 3 catch.
- **Bycatch/Release: 25%** This application is designed to enhance the collection of type 9 catch with has been identified as a priority of the ACCSP Recreational Technical Committee.

**Impact on stock assessment:**

- The increase in Recreational Bycatch data and Biological data from 12 partners from (GA – ME) will greatly improve stock assessments.

**Other Factors:**

If successful, the technology utilized in this project could be expanded to enhance commercial port sampling and observer program functionality by providing a paperless hands-free electronic method to collect specimen lengths and eliminate the need for transcription / key entry of the data into a database.

**Innovative:**

Bluetooth headsets, and voice recognition is a new concept for dockside and at sea collection of fishery dependent data. If successful it could have far reaching impacts and cost saving for both fisheries dependent and independent sampling techniques. The innovation is the ability of having no cellular connection for voice to text translations for Headboat assignments.

## MICHAEL J BUCKO

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### Education

#### **B.S., Physics, 1978**

UMASS - Dartmouth, North Dartmouth, MA

### Work History

#### **Rhode Island APAIS Lead Biologist – ASMFC (Oct 2015 – Present)**

DEM –RIDFW Coastal Fishing Laboratory, Wakefield RI

- Acts as contact person for constituent questions regarding survey protocol
- Maintains and coordinates APAIS field sampler assignments (dockside & at sea)
- Performs daily/weekly field staff oversight and monitors weekly assignments
- Leads staff training on procedures and fish identification
- Performs phone validations for 10% of all intercepts completed (by sampler)
- Maintains state site registry information
- In consultation with MRIP, recommends base & add-on site allocation requests to ACCSP for site assignment draws
- Submits weekly data and assignment tracking to ACCSP for entry and processing
- Participates in data collection and data QA/QC
- Provides for-hire vessel directory changes as identified by field staff
- Conduct field interview assignments as needed, following APAIS survey procedures;
- Participates in ACCSP and MRIP APAIS meetings

Bucko's Tackle, Fall River, Ma

#### **Manager/owner, 1978 - 2016**

I have worked all aspects of the job from billing to retail sales and handling employees at Bucko's Tackle.

### Experience

ACCSP, Arlington, VA

**Advisor, 2004 - 2015**

Represented Rhode Island recreational fishing in recreational data collection also attended MRFSS Constituents Wave Review from 2005 to 2009.

2009 - 2011

ACCSP ADVISOR COMMITTEE, CHAIRMAN, Arlington VA

As chairman of the ACCSP Advisor Committee, I have attended all the Operation Committee meeting and the Annual Coordination Council meeting presenting Advisory Committee rankings.

ACCSP, Arlington, VA

**ACCSP Advisor on Recreational-Technical Committee, 2006 - 2015**

My involvement on this committee is to represent first the ACCSP Advisory Committee as well as Rhode Island recreational fishermen.

Brookhaven National Laboratory, Brookhaven NY

**Lab Technician, 1976 - 1978**

I worked at the high energy lab on a work study program from Umass Dartmouth. My job was to provide support in building high energy detectors and wiring them into a CRAY computer.

**General Manager, 1977 – 1978**

Umass radio Station WUMD, North Dartmouth MA

My job was managing all aspect of the radio station. As manager I worked with a 7-member executive board. We managed 50 students operating the station.

- We helped develop a long-term strategic plan to increase the radio station power to ensure continued and future operations radio stations with the FCC.
- We worked with the executive board in adding by-laws to improve continued operation of the radio station and to have it remain as a student operated station.

## **Accomplishments**

- My current career accomplishment at the ACCSP was developing the "Guidelines for ACCSP Advisors". Evolved in the basic format which was used as an outline. I wrote many of the key roles and sections of this guideline manual.
- Served on the Recreational Technical Committee from May 2011-2012, during which time we were involved redesigning the Recreational Data Standard for the ACCSP to be put in the 3rd Edition of ACCSP Program Design.
- The Recreational Technical Committee has been working on the State conduct of APAIS on the Recreational Technical committee from 2014 to 2015.