



# REPORT ON USE OF THE NATURE INTELLIGENCE SYSTEM:

## Automated Screening of Commercial Import Documentation – Simulation

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## EXECUTIVE SUMMARY

### NATURE INTELLIGENCE SYSTEM (NIS)

“INSTEAD OF FINDING THE NEEDLE IN THE HAYSTACK, THE NIS REMOVES THE HAYSTACK TO MAKE IT EASIER TO FIND THE NEEDLES.”

DR. MICHAEL TLUSTY AND DR. ANDREW RHYNE, DEVELOPERS OF THE NIS

This simulation tested whether border services officers (BSO)s using the Nature Intelligence System (NIS) made more informed decisions than those made under the current situation on shipments of aquatic animals, and whether they intercepted those species that were prohibited or non-compliant at the border.

For the purposes of this simulation, scans of commercial invoices for 70 import transactions for already released shipments were provided under contract to the NIS developers; the invoices were processed through the system architecture to flag prohibited and regulated species to BSOs by way of a ‘dashboard’ for each import transaction. BSO participants in the simulation reviewed assigned transactions as if they were ‘live’ and made decisions as to whether to request additional information from the importer (e.g., request scientific names), release the shipment, or refer to Other Government Departments (OGD), specifically Fisheries and Oceans Canada (DFO), Canadian Food Inspection Agency (CFIA) and Environment and Climate Change Canada (ECCC). OGD officer participants, who received email referrals from BSOs, accessed the NIS to determine follow up actions for the referrals. Senior Officer Trade Compliance (SOTC) participants also reviewed transactions from a tariff classification perspective.

The simulation demonstrates clearly that the Artificial Intelligence (AI) technology used, the Nature Intelligence System, is significantly more effective than the procedures and technologies currently in place, which allowed 63% of the 70 commercial transactions to be released into Canada in error. The AI technology recognizes taxonomic names on commercial invoices, flags those species that are prohibited or regulated, and assigns correct Harmonized System (HS) codes based on taxonomy. The AI technology links to multiple international taxonomic databases and essentially transfers scientific expertise to BSOs to enable informed, evidence-based decision-making at the border.

Recommendations are made to prioritize the identified data integrity gaps, which compromise biosecurity at Canada’s borders, and move this initiative forward to a live pilot at selected ports of entry.

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## INTRODUCTION

The purpose of this simulation was to test whether the Nature Intelligence System (NIS) platform assisted border services officers (BSO) with making informed decisions on shipments containing aquatic species in the aquarium and live fish and seafood trade and whether use of the NIS would improve decision-making at the border for shipments containing regulated species of aquatic animals and plants imported into Canada.

A secondary objective was to determine whether the information provided by the NIS on corrected Harmonized System (HS) codes for aquatic species in shipments supported Senior Officer Trade Compliance (SOTC) decisions on determination of proper HS codes.

Every year, thousands of shipments of unidentified species are processed by customs officers, who, without significant improvements to technology, cannot reliably determine admissibility of those species. The advent of Artificial Intelligence (AI) technology, specifically the Nature Intelligence System (NIS), developed as a partnership between Dr. Michael Tlusty, University of Massachusetts Boston (UMB), Dr. Andrew Rhyne, Roger Williams University (RWU), Conservation International, and Microsoft, brings the opportunity to apply advanced data science analytics to the information in import and shipping documents. The NIS enables customs officers to evaluate import documentation that is electronically scanned, including commercial invoices and manifests, by flagging anomalies and prohibited and regulated species in the documentation.

The intention of testing this AI technology, which captures, standardizes and digitizes data, and uses algorithms and machine learning to conduct automatic text analyses, in this case based on scientific

names of species, is to find a monitoring tool that can provide greater knowledge of species in trade, facilitate trade, support efficient trade controls for wildlife, livestock, domestic animals and plants, and provide an effective means of sharing species trade data among government and nongovernment agencies and the public. The species data can be separated from protected client information and posted on Canada's [Open Data](#) portal.

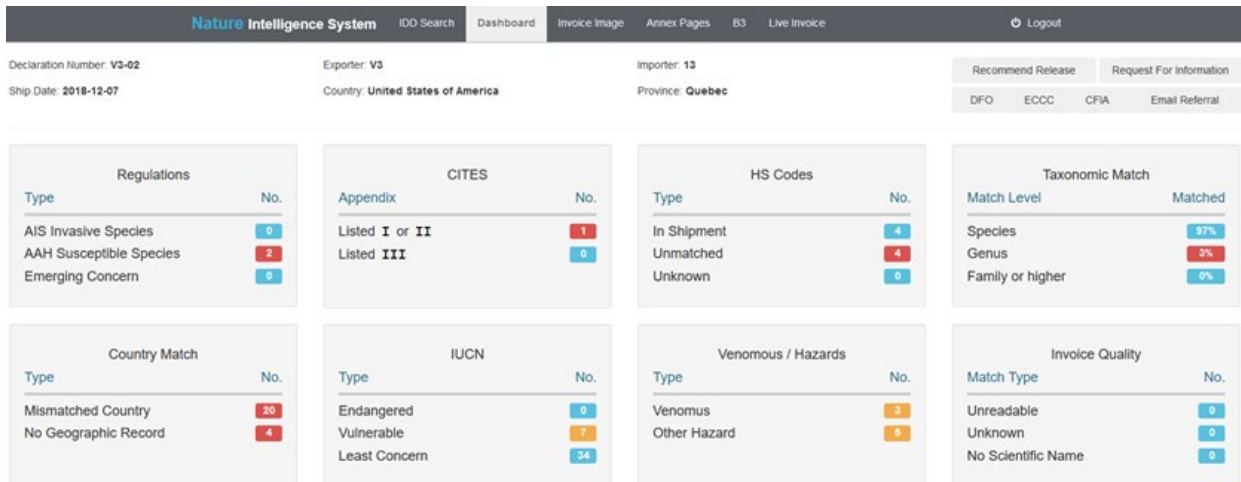
Under a CBSA contract with RWU, administered by the Food Plant and Animal (FPA) Program in Commercial and Trade Branch, in collaboration with Environmental Operations in Finance and Corporate Management Branch and with Fisheries and Oceans Canada (DFO)'s National Aquatic Invasive Species Program, selected import transactions for shipments of aquatic species already released into Canada were reviewed as part of a 'simulation' exercise for species regulated by DFO and Provinces/Territories (Aquatic Invasive Species-AIS), the Canadian Food Inspection Agency (CFIA, Aquatic Animal Health-AAH), and Environment and Climate Change Canada (ECCC – Convention on International Trade in Endangered Species of Fauna and Flora [CITES]). Scans of 52 paper transactions (50 cash entries and 2 RMD entries) and Release Summary Views for 18 Integrated Import Declarations were provided to RWU for input to the NIS. A dashboard, designed by Dr. Rhyne and Dr. Tlusty, originally for the U.S. Fish and Wildlife Service, was modified for CBSA based on input from FPA and BSO participants. The purpose of the dashboard is, for each transaction, to alert BSOs to all species in each shipment that are regulated or prohibited under the relevant CFIA, DFO, provincial, territorial, and ECCC legislation. The dashboard is also designed to alert SOTCs to Harmonized System (HS) code errors in each declaration.

## **METHODS**

### **General**

A total of 70 commercial invoices from import documentation (52 paper transactions representing 6 vendors and 17 importers, and 18 Integrated Import Declarations [IID] representing 16 vendors, 14 importers, and 12 customs brokers) were provided to Drs. Rhyne and Tlusty under secure procedures. The information entered to the NIS was anonymized, i.e., lacking ancillary permits, certificates, and exporter and importer information, and with renamed transaction numbers. The original paper documents (or copies) were obtained from CBSA 'Records' and the IID Release Summary Views were obtained from the Integrated Customs System (ICS). When these invoices were originally live and presented to CBSA as part of import declarations, all were released into Canada. For the simulation, the documents were processed by the NIS software to collect species, origin, and quantity information. The resultant data were then automatically assessed by the NIS as to whether the shipments contained any species on the Aquatic Invasive Species (AIS) or Aquatic Animal Health (AAH) lists (see Appendix 1), or are CITES-listed according to the CITES control list on the international CITES Secretariat web site. The NIS processed and analyzed the import data and summarized the data in a dashboard (example in Figure 1) for each transaction, accessible on a password protected web site.

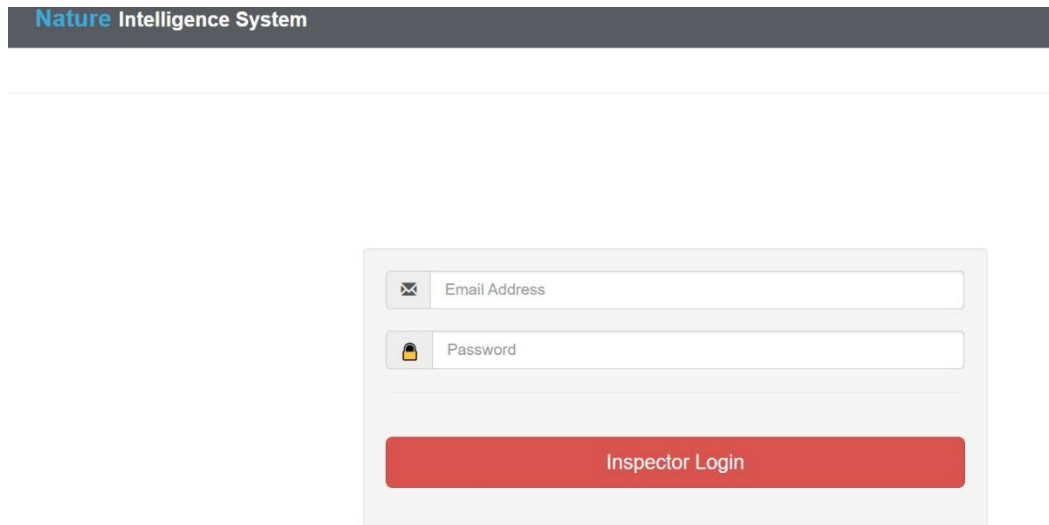
**Figure 1. Top portion of a Dashboard of information collected from import documents and provided to BSOs for the NIS test. This dashboard categorizes the species information on invoices as Aquatic Invasive Species (AIS), species subject to Aquatic Animal Health requirements (AAH), species that are CITES listed, and species under emerging concerns (e.g., moss balls that may be infested with invasive zebra mussels). This dashboard also contains information on HS codes declared properly and improperly in the import declaration, and other information that will be described in the Results section.**



Five or six transaction numbers (termed ‘Request ID’ number in ACROSS) were assigned to each BSO and SOTC participant. BSO, SOTC, and OGD participants in the simulation represent all regions and are contributors to this report and will assist with the refinement of the Dashboard and flagging system when the technology is implemented as a pilot in real time.

**Border Services Officers (BSOs)** were instructed to link to the Nature Intelligence System (NIS) website: <https://canada.natureintelligence.trade>. Passwords and user ID’s were provided in advance. The NIS prompts the user to enter their email and password (Figure 2).

**Figure 2. Sign on Screen for the NIS.**



Each ‘Document ID # in the list of BSO and SOTC transactions assignments was linked to an actual transaction number; the original import documents are stored for BSO and SOTC access only. BSOs and SOTCs were instructed to choose the transactions assigned, from the NIS “Worklist” of 70 ‘Integrated Import Declaration’<sup>1</sup> numbers identified in the NIS (Figure 3).

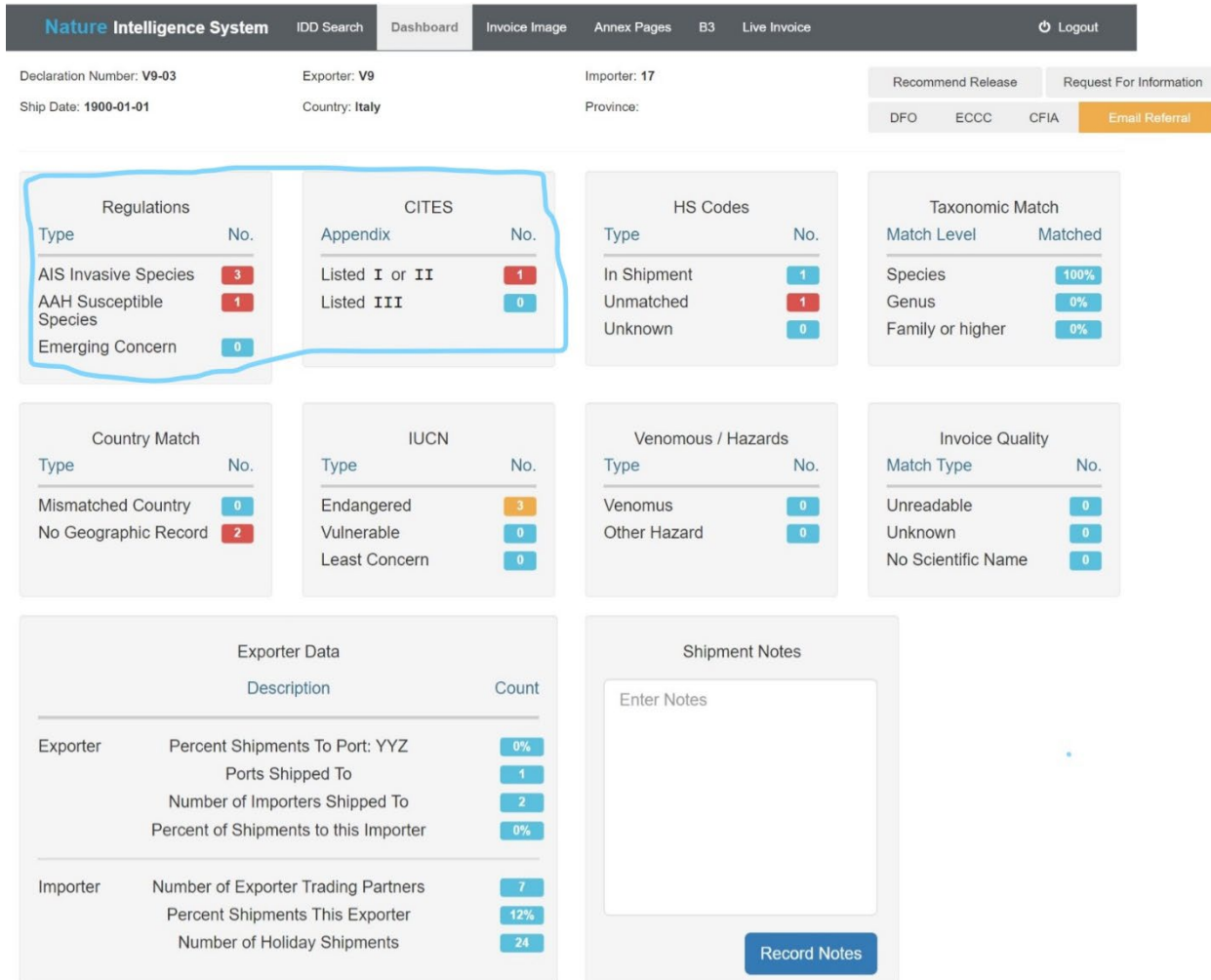
**Figure 3. Declaration ‘work list’ in NIS.**

Declaration No.	Exporter Country	Importer Province	Date	Inspection Status	
V1-01	Singapore	British Columbia	2017-01-18	Referred to DFO,CFIA	Load Dashboard
V1-02	Singapore	British Columbia	2017-02-15	Referred to DFO	Load Dashboard
V1-03	Singapore	British Columbia	2017-03-29	Released	Load Dashboard
V1-04	Singapore	British Columbia	2017-05-31	Referred to DFO,CFIA	Load Dashboard
V1-05	Singapore	British Columbia	2018-01-10	Referred to DFO,CFIA	Load Dashboard

<sup>1</sup> The term, Integrated Import Declaration, was mistakenly used in the NIS platform as this term could be confused with actual Single Window Integrated Import Declaration (IID)s that were included in the simulation. Consequently, this term will not be used in the re-design phase. The terms and transaction numbers will be aligned with those used in ACROSS.

For each transaction assigned, BSOs reviewed the Dashboard, focusing on the 2 boxes in the left top corner (Figure 4): ‘Regulations’ and ‘CITES’. If any of the indicators within those boxes were flagged in red, BSOs would click on the red flags and open the list of species subject to the regulations indicated (Figures 4 and 5).

**Figure 4. Complete Dashboard indicating area of focus (outlined in blue) for BSOs.**





**Figure 5a.** When a BSO clicks on AIS red flag shown in Figure 4, the AIS species in the shipment are indicated (example below, *Clarias batrachus*).

Line No.	Code	Common Name	Scientific Name	Quantity	Unit Price	Amount	Regulation Flags
5		Assorted walking catfish/Clarias	Clarias batrachus	15	\$0.27	\$4.05	AIS Species

**Figure 5b.** By clicking on the red flagged species in Figure 5a, in this case walking catfish, a snippet of the actual line in the commercial invoice for that species is indicated.

Code	Common Name	Scientific Name	Quantity	Unit Price	Amount	Regulation Flags
	Assorted walking catfish/Clarias	Clarias batrachus	15	\$0.27	\$4.05	AIS Species
15	Clarias batrachus (Assorted)	Assorted walking catfish/Claria	5cm	0.270	4.050	

**Figure 5c.** By clicking on the invoice description, information on the species, including taxonomic hierarchy, images for identification and distribution, pop up in a separate tab.

The screenshot shows a web browser window with the URL <https://www.gbif.org/species/5202683>. The page title is "Clarias batrachus (Linnaeus, 1758)". The left sidebar shows the taxonomic classification:

- Kingdom: Animalia
- Phylum: Chordata
- Class: Actinopterygii
- Order: Siluriformes
- Family: Clariidae
- Genus: *Clarias* Scopoli, 1777
- Species: *Clarias batrachus* (Linnaeus, 1758)
- Subspecies:
  - = *Clarias assamensis* Day, 1877
  - = *Clarias batrachus* (Linnaeus, 1758)
  - = *Clarias maurus* Valenciennes, 1840

The main content area shows "150 OCCURRENCES WITH IMAGES" and "1,213 GEOREFERENCED RECORDS". There are several small images of the fish and a world map with yellow dots indicating distribution locations.

When species were red flagged, BSOs were instructed to click on the email referral button to one or more of the appropriate Other Government Departments (OGDs) (see Figures 4 and 5, top right corner 'Email Referral button'). The NIS is capable of sending automated emails to the OGDs, but for the purposes of this simulation, when BSOs clicked on the referral button, automated emails were not sent. Nevertheless, the NIS used the information to analyze the results of this test. To notify OGDs, BSOs were instructed to send actual emails to pre-determined email addresses for DFO Conservation & Protection, ECCC Wildlife Enforcement, and CFIA Operations and Enforcement and Investigation Services for referral of AIS, CITES, and AAH species, respectively. OGD participants in the simulation who received the emails also had password protected access to the NIS and were instructed to access the NIS to view the invoice information and provide feedback to BSOs as to whether the shipment referred should be theoretically held for inspection or released.

In cases where the information provided in the import documentation was insufficient to determine whether to release or refer, the BSO could click the Request for Information button, also in the top right corner of the Dashboard (see Figure 4) to indicate that the BSO would reject the entry and request more information on the species in the shipment.

If there were no red flags for a shipment, the BSO clicked on the 'Recommend Release' button, also in the top right corner of the Dashboard (Figure 4).

BSOs interacted with the dashboard in this trial test as described above and provided feedback as to user friendliness, whether they released, requested more information, or referred each shipment, and any other pertinent comments on the NIS in a BSO and SOTC Actions Log, and OGDs similarly provided feedback in an OGD Actions Log.

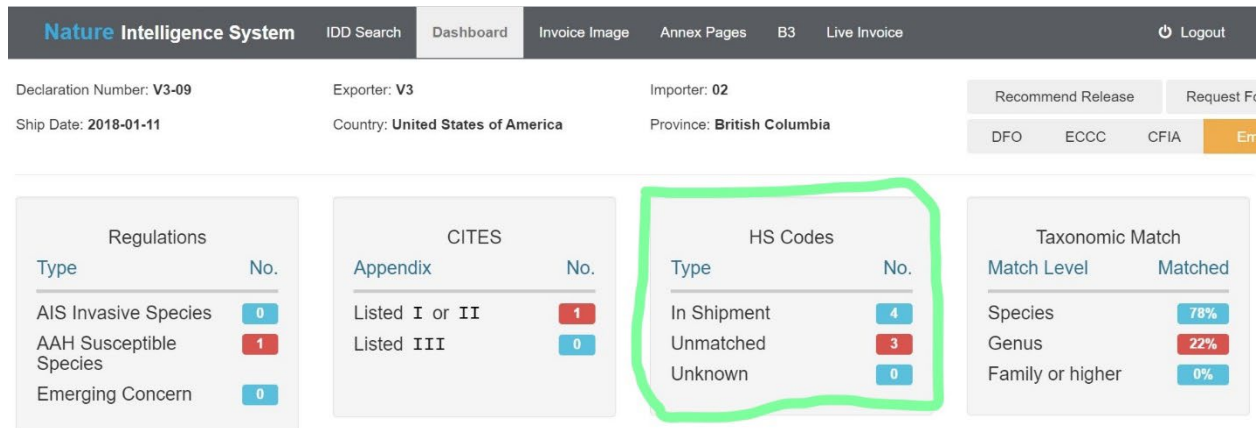
For reasons of security, the original paperwork, including permits and certificates, were not accessible during the NIS simulation. BSOs who had the time to check the original paperwork or electronic IID for each shipment with one or more red flags could link to the actual transaction from the list of BSO and SOTC transaction assignments for simulation and check the original transaction for the presence of an Aquatic Animal Health Import Permit and Zoosanitary Certificate for CFIA, or a CITES Permit for ECCC and make their decision to release or refer based on the presence or absence of the proper permit documentation. In future, images of the original invoice, permit, manifest, and other import documentation will be captured by the NIS and accessible to BSOs, SOTCs and OGDs in real time.

Yellow flags were used in the NIS to indicate that there were potential species of concern in a shipment and BSOs were in a position to release, request more information or refer, depending on the number of flags and issues identified on the dashboard.

**Senior Officers Trade Compliance (SOTC)** followed the same instructions as BSOs, but they focused on the box indicated as 'HS Codes' on the top row of the Dashboard to the right of the CITES Box (see Figures 4 and 5). When proper HS codes are not declared in a shipment, 'Unmatched' HS codes are flagged in red (Figure 6a). SOTCs were instructed to click on the red flags to open the lists of species for which HS codes were not correctly declared. Correct HS codes for live fish, molluscs,

crustaceans, other invertebrates, plants, and amphibians (in some cases the NIS is capable of assigning only the Chapter, heading, or subheading) are assigned on the basis of taxonomy and indicated for each species in the list on the left hand side (see Figure 6b).

**Figure 6a. HS Code Indicator on Dashboard**



**Figure 6b. List of species with corrected HS codes (in this case headings-4 digits) on left**

The screenshot shows the Nature Intelligence System dashboard with the following table of species:

Line No.	Code	Common Name	Scientific Name	Quantity	Unit Price	Amount	HS Codes
12	0306	CRAB, HERMIT HALLOWEEN BL	Calcinus elegans	9	\$3.60	\$32.40	HS not on B3
8	0307	SCALLOP, ELECTRIC/FLAME	Limaria hians	3	\$5.99	\$17.97	HS not on B3
11	0307	SEA SLUG, COLOR ASSORTED	Hexabranchnus morsomus	12	\$4.99	\$59.88	HS not on B3
13	0307	#SNAIL, NASSARIUS SNA	Nassarius	50	\$0.45	\$22.50	HS not on B3
27	0307	SMALL GIANT CLAM	Tridacna maxima	6	\$15.00	\$90.00	HS not on B3
9	0308	URCHIN, TUXEDO	Mespilia globulus	3	\$7.50	\$22.50	HS not on B3
10	0308	#URCHIN, TUXEDO ORANGE	Mespilia globulus	3	\$9.50	\$28.50	HS not on B3
15	0308	CORAL	Acanthastrea	6	\$20.00	\$120.00	HS not on B3

**Other Government Department (OGD) Officers or Inspectors** followed the same steps as above for BSOs and were instructed to review the dashboards and species for the transactions for which they received referrals and enter their actions and comments on the NIS in the OGD Actions Log.

Officers who wanted access to the actual transaction #, importer, vendor, and original commercial invoice to follow up because many of these transactions had been incorrectly released in the first place were able to request these from the BSO who referred the entry to them.

## RESULTS

### Summary of Results

BSOs encountered almost [900 species](#) on the commercial invoices for 70 import transactions. Of the 70 transactions, 29 (41%) were red-flagged for one or more species and 12 (17%) provided insufficient information on the invoices. Of the 900 species, 10 are listed as prohibited aquatic invasive species (AIS) by DFO and/or provinces and territories, 15 species are listed as susceptible species of aquatic animals subject to aquatic animal health requirements (AAH) by the CFIA, and 50 species are CITES listed, subject to permit requirements by ECCC (see Appendix 2 for species lists).

BSOs generally successfully interacted with the dashboards to decide whether the information and documentation declared and presented for shipments was sufficient and complete for release, or whether they required additional information or believed the shipment to be non-compliant and referred to one or more of DFO, ECCC, and CFIA.

Of the 70 transactions, representing numerous Trade Chain Partners (customs brokers, importers, vendors) (Tables 1 and 2) for shipments used for this simulation, all were originally released. Upon re-review of each transaction by BSOs using the NIS, it was determined that 50% of the 52 paper transactions were released in error and all of the 18 IIDs were released in error<sup>2</sup>. Overall, 63% of the 70 transactions should have resulted in either a reject for a ‘Request for Information’ back to the importer or customs broker because there was not enough information upon which to make a decision, or they should have been referred to one or more OGDs.

**Table 1. Numbers of Trade Chain Partners (TCP) in test paper transactions (52 transactions) and percent of transactions released in error**

TCP	Number of TCPs	Number of Shipments	Shipments Released in Error (%)
Customs Brokers	1	2	50%
Importers	17	52	50%
Vendors	6	52	50%

<sup>2</sup> Note that the IIDs were selectively chosen for the simulation to demonstrate non-compliance; hence the 100% error rate for IIDs. In contrast, the paper transactions chosen for the simulation demonstrated both compliant and non-compliant transactions. To adequately run the simulation and test the effectiveness of the NIS, the proportion of non-compliant transactions was selected to be greater than what BSOs experience in everyday operations.

**Table 2. Numbers of Trade Chain Partners in test IIDs (18 transactions) and percent of transactions released in error**

<b>TCP</b>	<b>Number of TCPs</b>	<b>Number of Shipments</b>	<b>Shipments Released in Error (%)</b>
Customs Brokers	12	18	100%
Importers	14	18	100%
Vendors	16	18	100%

### **Insufficient Information in the Commercial Invoice**

There are many instances when importers and customs brokers do not provide sufficient information upon which a BSO or SOTC can make a decision about what a species is and whether it is regulated, or even prohibited and whether the HS code declared is correct. Examples encountered during this simulation are provided in Table 3. The most egregious example is illustrated in Figure 7.

**Table 3. Aquatic animals and plants that were not identified by scientific names on invoices**

<b>Name</b>	<b>Quantity (Number of individuals, unless other-wise indicated)</b>	<b>Importers</b>	<b>Shipments</b>
Live Freshwater Ornamental Fish (see Figure 7)	4,021	1	1
Coral	433	1	1
Hermit, Red-Leg	300	1	1
DanioZebra Cosmic Blue	100	1	1
Zebra Dark Green	100	1	1
Fighter Female Assorted	40	1	1
Live Freshwater	25	1	1
Halfmoon Fighter Male	20	1	1
Brine Shrimp Bulk Cubes 1 Dry	15	1	1

Name	Quantity (Number of individuals, unless other-wise indicated	Importers	Shipments
TR/P Clown, Percula True	15	1	1
Conch	1,000 kg	1	1
Discus assorted	23	1	1
Assorted Bunched Plants	50	1	1
Aquatic potted plants	342	1	1
Banana Plant	1	1	1
Frozen softshell turtle	220 kg	1	1

**Figure 7. Example of Commercial Invoice Description that is insufficient to make a release decision in an IID. This invoice could include AIS, AAH and CITES species, but without the scientific names of the organisms, the requirements are not known. Furthermore, importers and customs brokers who submit an IID are required by *Health of Animals Regulations* to report scientific names of finfish, molluscs and crustaceans to the CFIA. They may use the CFIA’s Automated Import Reference System (AIRS) codes for species, but in this case the broker used a generic AIRS code, indicating ‘other’ species, leaving the CFIA requirement unfulfilled.**

Line No.	Code	Common Name	Scientific Name	Quantity	Unit Price	Amount	Invoice Quality
1		LIVE FRESHWATER ORNAMENTAL FISH	LIVE FRESHWATER ORNAMENTAL FISH	4,021	\$0.37	\$1,929.58	Unmatched
005/XI/20	1	1	0301110000 Fish - ornamental, live, freshwater	LIVE FRESHWATER ORNAMENTAL FISH   LIVE FRESHWATER ORNAMENTAL FISH   null	ID	4,021 EA 0.37 USD	1,929.58 CAD

In some cases, species are described by scientific name, but the scientific name is incomplete. Examples are shown in Table 4 and Figure 8.

**Table 4. Species potentially subject to regulation identified to Genus only**

Genus	Potential requirement	Quantity	Importers	Shipments
<i>Strombus</i> spp.	CITES	300 kg	1	1
<i>Cheilinus</i> spp.	CITES	1	1	1
<i>Calappa</i> spp.	AAH	1	1	1
<i>Uca</i> spp.	AAH	4	1	1
<i>Egeria</i> spp.	AIS	40	1	2
<i>Cabomba</i> spp.	AIS	40	1	2

**Figure 8a. Example of commercial invoice in which a species is identified to genus only, but has a high probability of being *Strombus gigas*, a CITES listed species, as indicated by country of origin.**

Line No.	Code	Common Name	Scientific Name	Quantity	Unit Price	Amount	Match Level
1		CONCH MEAT, STROMBUS SPP.	Strombus	16	\$300.00	\$4,800.00	Genus
2		CONCH MEAT, STROMBUS SPP.	Strombus	5	\$320.00	\$1,600.00	Genus

**Figure 8b. Example of a commercial invoice in which a species is identified to genus only, but may be subject to AAH requirements. There are 41 species of *Calappa*, but only two species are listed by the CFIA. In order to determine whether permits or certificates are required, the complete species name must be declared.**

Code	Common Name	Scientific Name	Quantity	Unit Price	Amount	Regulation Flags
1 S	Crabs:Shameface :: East Americas Calappa sp. U.S.A.	Calappa	1	\$9.95	\$9.95	AAH Genus

**Figure 8c. Example of commercial invoice in which two species are identified to genus only and may be listed as AIS, in this case, *Egeria* and *Cabomba*.**

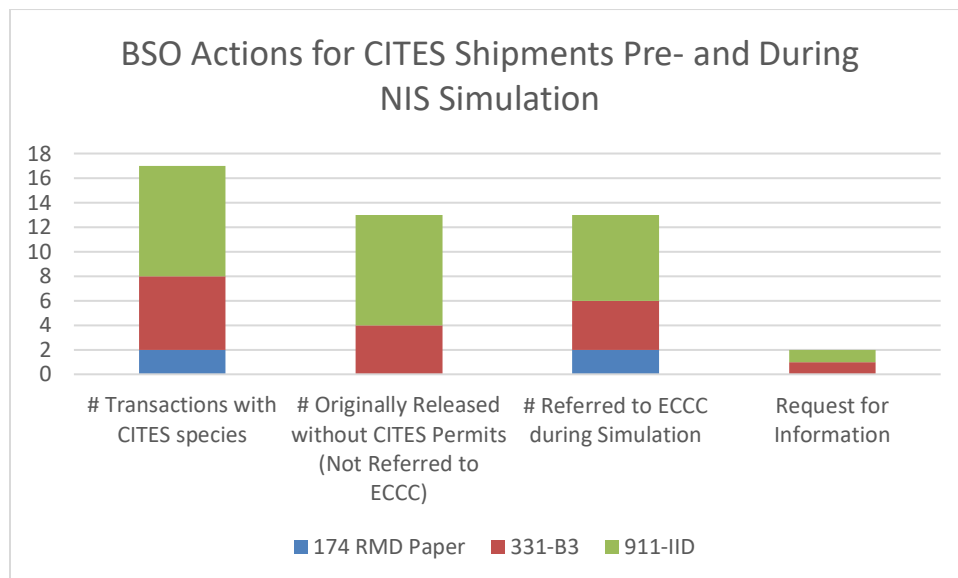
26	2	ASSORTED BUNCHED PLANT REG, EGERIA, CABOMBA, CERTOPHYLLUM, HY GROPHILIA			Egeria	100	\$1.05	\$141.92	AIS Genus
1	6	15	0602909090	Plants - (including their roots), cuttings and slips, NES	ASSORTED BUNCHED PLANT REG/EGERIA, CABOMBA, CERTOPHYLLUM, HY GROPHILIA	US	100 NMB	1.05 CAD	141.92 CAD

The NIS takes into account situations where more information (i.e., scientific names or complete scientific names) is required to make a decision and indicators to the BSO are found in the boxes titled, ‘Taxonomic Match’ and/or ‘Invoice Quality’ on the right side of the dashboard (see Figure 4). During the simulation, BSOs requested more information for 14 transactions. In some cases, there was confusion about when to request more information and this can be attributed to the set up of the dashboard and limited training and instructions provided to BSOs.

### Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

Of the 70 transactions, 17 (24%) included CITES species, but only 4 of the 17 had copies of CITES permits attached or evidence that CITES permits were originally presented (23.5% compliant). The remaining 13 transactions were released without presentation of CITES permits to the CBSA as required. During the simulation, BSOs referred most of these transactions to ECCC and in two cases requested more information back to the importer (Figure 9). A list of CITES species can be found in Appendix 2.

**Figure 9. Results of the Simulation for CITES.**



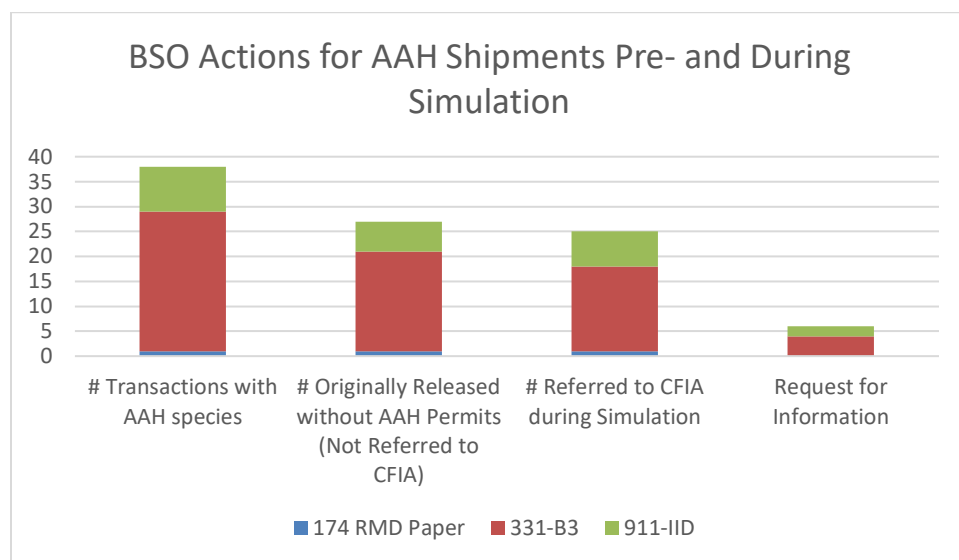
### Aquatic Animal Health (AAH)

Thirty-eight (54%) of the 70 transactions included AAH species and 13 of the 38 transactions had the proper import permits and/or zoosanitary certificates presented with the import documentation (i.e. 34%



compliant). During the simulation, BSOs referred most of these transactions to the CFIA and requested more information for 6 transactions (Figure 10). A list of AAH species can be found in Appendix 2.

**Figure 10. Results of the Simulation for AAH**



The NIS was able to flag ‘suspicious’ shipments for which the country of origin / export of shipments of fish and seafood did not match the true distribution of the species. Importers may declare species that are different from those actually in the shipments to avoid AAH import permit requirements. Table 5 and Figure 11 show examples.

**Table 5. Species substitutions to avoid AAH permit requirements for seafood originating in South Korea**

Species Declared on Invoice (live)	Likely Species (from prior declarations or known distribution)	Quantity (kg)	Number of Importers	Number of Shipments
<i>Paralichthys californicus</i> <sup>3</sup>	<i>Paralichthys olivaceus</i>	396	1	5
<i>Hippoglossus stenolepis</i> <sup>4</sup>	<i>Paralichthys olivaceus</i> or <i>Psetta maxima</i>	709	1	2
<i>Hippoglossina stomata</i> <sup>5</sup>	<i>Paralichthys olivaceus</i> or <i>Psetta maxima</i>	72	1	1

<sup>3</sup> This species occurs off the western U.S. coast and is not cultured in Korea.

<sup>4</sup> Pacific Halibut is not known to be cultured in Korea or harvested by Korea.

<sup>5</sup> This species occurs off the western U.S. coast and has a subsistence fishery only.

Species Declared on Invoice (live)	Likely Species (from prior declarations or known distribution)	Quantity (kg)	Number of Importers	Number of Shipments
<i>Scophthalmus rhombus</i> <sup>6</sup>	<i>Psetta maxima</i>	260	1	1
<i>Haliotis iris</i> <sup>7</sup>	<i>Haliotis discus hannai</i>	27	1	6
<i>Haliotis roei</i> <sup>8</sup>	<i>Haliotis discus hannai</i>	10	1	1

Figure 11. Example of an invoice declaring *Paralichthys californicus* and *Haliotis iris*, and NIS links showing distribution of *P. californicus* and *H. iris* (i.e., distributions do not include Korea). Importing *P. olivaceus* and *Haliotis discus hannai* from South Korea requires an aquatic animal health import permit issued by the CFIA and a zoosanitary certificate issued by an official from South Korea. Note also that the Korean language is used in the commercial invoice description. Although the NIS did not do so for the purposes of this simulation, it can be programmed to recognize common names of species in other languages and can thereby flag discrepancies between the English or French commodity descriptions and descriptions in other languages.

**Nature Intelligence System** | [IDD Search](#) | [Dashboard](#) | [Invoice Image](#) | [Annex Pages](#) | [B3](#) | [Live Invoice](#) | [Logout](#)

Declaration Number: V5-07 | Ship Date: 2018-10-19 | Exporter: V5 | Country: South Korea | Importer: 16 | Province: Ontario

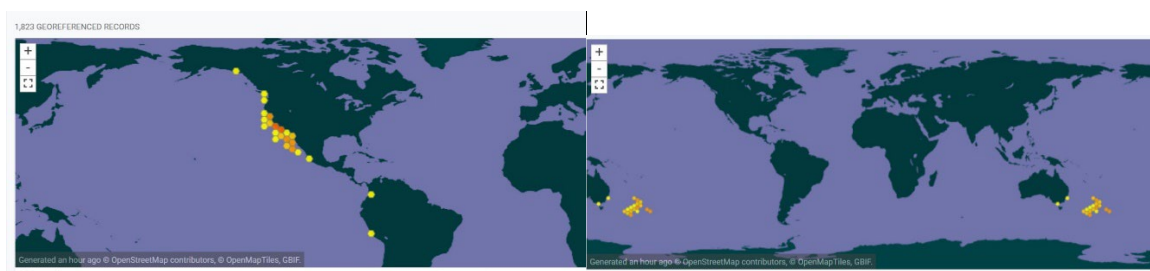
[DFO](#) | [ECCC](#) | [CFIA](#) | [Em](#)

Search Table?

Line No.	Code	Common Name	Scientific Name	Quantity	Unit Price	Amount	Regulation Flags
1		Live California flounder	<i>Paralichthys californicus</i>	7	\$352.71	\$2,469.00	AAH Genus
	0301990090	7 Ctns   Live California flounder ( <i>paralichthys californicus</i> )-(1ctn=6pcs=9kg)광어			\$	352.71 /Ctn	CAD\$ 2,469.00
5		Live Abalone	<i>Haliotis iris</i>		\$127.00	\$127.00	AAH Genus
	0307810000	Live Abalone( <i>Haliotis Iris</i> )-(51cs=3kg)전복			\$	127.00 /Ctn	CAD\$ 127.00

### Distribution of *P. californicus*

### Distribution of *H. iris*



<sup>6</sup> According to websites, turbot exported from KR is “jeju turbot”, or *Psetta maxima*

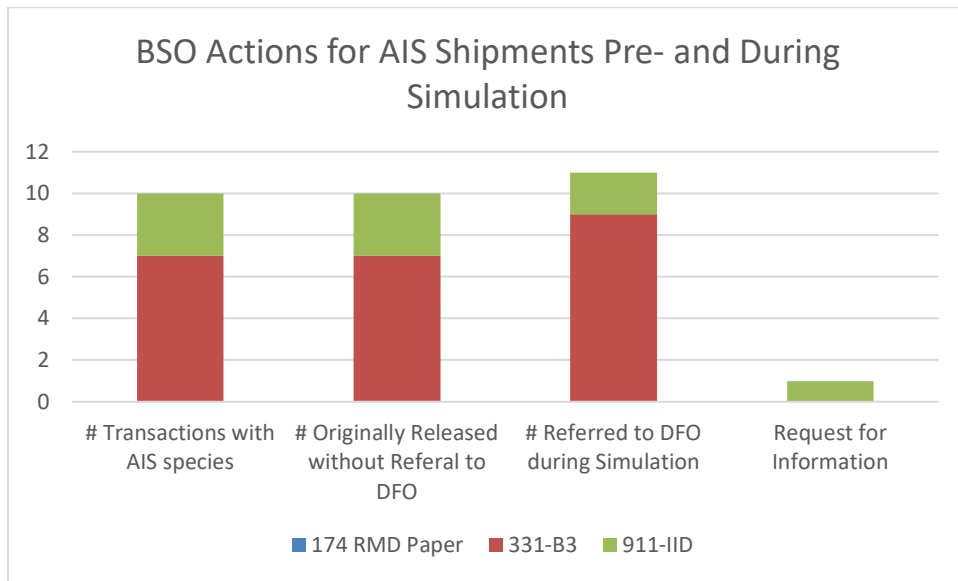
<sup>7</sup> This species does not occur in Korea

<sup>8</sup> Occurs in the eastern Indian Ocean off of the western coast of Australia

### Aquatic Invasive Species (AIS)

Ten (14%) of the 70 transactions included prohibited AIS species (See Appendix 2, AIS Species for list of species) (Figure 12). This analysis includes two transactions for shipments imported into BC containing koi, *Cyprinus carpio koi*, which DFO considers invasive in Pacific Region. Nevertheless, this species can be authorized for transport from one location (e.g., VIA) to another (e.g. importer premises) under the *Fishery (General) Regulations* made under the *Fisheries Act*. Both imports of this species into BC had a copy of this authorization.

**Figure 12. Results of the Simulation for AIS**



Eight (11%) of the 70 transactions included species that were both AIS and AAH, thus requiring that the transactions be referred to both DFO and the CFIA. Three (4%) of the 70 transactions included species that were both CITES and AAH, requiring referral to both ECCC and the CFIA. One transaction included CITES, AAH, and AIS species, requiring referral to all three agencies.

### Harmonized System (HS) Code Errors

HS errors were detected in 6 of the 18 IID transactions (33%) and 46 of the 52 paper transactions (88%), with an overall error rate of 74%. Examples of HS code errors are provided in Table 6.

**Table 6. Examples of Harmonized System (HS) code errors for organisms declared in the 70 import declarations screened for the simulation.**

<b>Common Name</b>	<b>Scientific Name</b>	<b>HS Code Declared</b>	<b>Proper HS Code</b>	<b># transactions with this species</b>
Unicorn fish	<i>Naso lituratus</i>	0301.11	0301.19	1
Guppy	<i>Poecilia reticulata</i>	0301.19	0301.11	2
Fresh jacobever, rockfish	<i>Sebastes schlegeli</i>	0301.99	0302.89	3
Beluga Caviar	Not provided	2005.99	1604.31	1
Aquatic Dwarf Frog	<i>Xenopus laevis</i>	0106.90.00.90	0106.90.00.20	3
African Brown Clawed Frog	<i>Hymenochirus boettgeri</i>	0106.90.00.90	0106.90.00.20	3
Snow white lobster	<i>Procambarus clarkii</i>	0306.32	0306.39	1
Mexican dwarf orange lobster	<i>Cambarellus patzcuarensis</i>	0306.32	0306.39	2
Red cherry shrimp	<i>Neocaradina reticulata</i>	0301.11	0306.36	1
Lobster Tail Frozen	Not provided	0306.12	0306.11	1
Sally Lightfoot Crab	<i>Percnon gibessi</i>	0301.19	0306.33	1
Various corals	Various species, e.g. <i>Fungia</i> spp.	0301.19	0308.90.90	6
Staghorn coral, live	<i>Acropora tenuis</i>	0508.00.00.90	0308.90.90	1
Giant Clam	<i>Tridacna maxima</i>	0301.19	0307.71	2
Cleaner Clam	<i>Mercenaria mercenaria</i>	0301.19	0307.71	1
Apple Snail	<i>Pomacea bridgesii</i>	0301.11	0307.60.90	1
Aquatic Potted Plants	Not provided	0301.11	0602.90	1
Banana Plant	Not provided	0301.19	0602.90	1
Grape Weed	<i>Caulerpa racemosa</i>	0301.11	0602.90	1

Red algae	<i>Rhodomenia</i> sp.	0301.19	0602.90	3
Moss Balls	<i>Cladophora aegagropila</i>	0604.20	0602.10	1
Dwarf Lily Bulbs	<i>Nymphaea rubra</i>	0301.19	0602.90	1
Marine Algae: Green Finger	<i>Codium</i> sp.	0301.19	0602.90	1

### Species not Included in the Simulation

Aquatic plants that were identified as prohibited aquatic invasive species were identified in the dashboards and referred to DFO for the purposes of the simulation. Other aquatic plants that were present in the shipments and not considered invasive, were not addressed by the NIS, although the species information was captured (see Appendix 2). Some of the shipments included plants that were not accompanied by phytosanitary certificates and/or import permits, and were therefore, non-compliant with plant protection legislation. For example, there were no phytosanitary import permits presented for the aquatic potted plants, the banana plant, and the dwarf lily bulbs (Table 6). Marine plants (macroscopic marine algae) were also often declared under HS codes for live fish or invertebrates.

Genetically modified fish, *Gymnocorymbus ternetzi* or tetra glofish, were imported. Although these were clearly indicated in the commercial invoice description field in the IID with NSN numbers provided in that field, the Genetic Modification Indicator for the DFO Biotechnology Program in the IID was not indicated and the NSN #s were not entered in the correct field, with the consequent lack of data for genetically modified organisms transferred to DFO.

### Targets

During the simulation, DFO became aware of a commodity being imported that was harbouring highly invasive zebra mussels. This commodity is called moss balls, or Marimo, the scientific name being *Cladophora aegagropila* (Figure 13). This is highly concerning since this commodity was imported all across Canada, including the western provinces and territories, which are directing a great deal of resources to preventing the introduction of zebra mussels.

**Figure 13. Moss balls are actually not a moss but a living algae that forms ‘balls’ and are popular in the aquarium trade.**



Using the NIS to review import documentation for a shipment of aquarium species, a BSO detected moss balls in a shipment and referred the shipment to DFO (Figure 14).

**Figure 14. The NIS can ‘target’ species of emerging concern by programming common and scientific names, in this case for moss balls, into the application. This example shows how moss balls were easily detected and flagged to the BSO for referral to DFO.**

The screenshot shows the NIS dashboard with the following data:

Regulations		CITES		HS Codes		Taxonomic Match	
Type	No.	Appendix	No.	Type	No.	Match Level	Matched
AIS Invasive Species	2	Listed I or II	0	In Shipment	5	Species	87%
AAH Susceptible Species	8	Listed III	0	Unmatched	0	Genus	6%
<b>Emerging Concern</b>	<b>1</b>			Unknown	1	Family or higher	6%

32	LIVE MOSS BALL PLANT SML,CHLADOPHORA AEGAGROPILA				Cladophora aegagropila	200	\$2.05	\$548.70	Zebra mussels found in moss balls	
1	6	15	0604201090	Grasses - fresh, including palm leaves, mosses, lichens and foliage of Asparagus setaceus, other	LIVE MOSS BALL PLANT SML/CHLADOPHORA AEGAGROPILA	US	200 EA	2.05 CAD	548.70 CAD	

## Additional Dashboard Features

### Venomous / Hazards

Safety of the BSOs and OGD officers and inspectors is paramount, and venomous animals are a concern for anyone conducting a physical inspection. The NIS alerts officers via the dashboard (see Figure 4, second row) to any venomous and / or hazardous species in a shipment so that officers can take precautions.

Within this set of invoices, a single shipment contained venomous lionfish (*Pterois* sp.), eight shipments from two importers contained rabbit fish (*Siganus* sp.), while two importers each had a single shipment containing Zoanthidae corals. Some Zoanthid coral species popular with marine aquarium enthusiasts can contain Palytoxin, a toxin that can be dangerous to inhale or to come into contact with; being exposed to it can have potentially life-threatening consequences.

### International Union for Conservation of Nature (IUCN)

This NIS can also be used to examine IUCN red-listed species being imported into Canada. The IUCN is an international union of 1,400 member organizations including States and government agencies, NGOs,

Indigenous Peoples' organisations, scientific and academic institutions and business associations. Examples of members from Canada are the Canadian Wildlife Service in Environment and Climate Change Canada and the Canadian Nature Museum. IUCN experts categorize species as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Data Deficient (DD), and Least Concern (LC). This simulation successfully identified species in these categories (see Appendix 2, Species List).

Some BSOs referred IUCN endangered species that were flagged to ECCC, but many of the IUCN Red List species are not listed under CITES and therefore not regulated by ECCC. Consequently, having the IUCN listed species on the dashboard is not necessary, although the information will be useful to the ECCC Scientific Authority and can be provided in a separate tab.

### **Exporter Data and Shipment Notes**

The NIS can generate information on exporters and importers (see bottom row of dashboard in Figure 4), and using machine learning, can identify suspicious commodities and suspicious behaviours. The NIS system can be tuned to focus on repeat offenders. While the time-series of this test did not allow for such an assessment, it was noted that V1 (refers to Vendor 1) and V4 (refers to Vendor 4) consistently provided accurate information with proper paperwork, whereas information and paperwork provided by V3 (refers to Vendor 3) was generally inadequate.

BSOs have the capability to make notes on a shipment on the dashboard. During the simulation, only one BSO entered notes, and another BSO indicated that they would have entered notes to inform future inspections.

### **BSO and SOTC Feedback on Use of Dashboard**

BSOs were relatively accurate in using the dashboard to assist with the decision as to whether a shipment should be released or referred. When provided with the invoices via the dashboard, BSOs referred 41 of the 70 transactions (58%) to other government agencies, released 15 (21%), and requested more information on the remaining 14 (20%).

For the 15 shipments that were Released immediately, 12 had no red flag warnings for AAH/AIS/CITES and thus were correctly released. This is a positive detection success rate of 80% for releases. For those referred to one or more government agencies (n=41), only 2 had no warnings and thus should not have been referred. The false negative detection rate is 5%.

BSOs and SOTCs were generally positive about the use of the Dashboard and NIS, but there was confusion with respect to flag colours, indicators for Genus versus Species, and the various boxes that were not directly useful for the BSOs, such as 'IUCN Species', thereby creating 'clutter' on the Dashboard. In addition, the Dashboard did not identify clearly when a transaction should be rejected back to the importer as a Request for Information. This resulted in the 'releases' of several transactions for which scientific names were not declared. Specific comments on use of the NIS can be found in Appendix 3.

**OGDs** were generally positive about use of the NIS, finding it easy to use and effective for referrals, and all indicated that it would be extremely helpful to have the live invoice and all associated import documents available to view in the NIS in real time. Comments were also provided to improve the design of the dashboard. Specific comments can be found in Appendix 4.

### **Use of NIS Data to Monitor Imports, Report to the Public, Conduct Risk and Trade Assessments, and Report on Interceptions and other Statistics**

The species data in Appendix 2 are generated rapidly and for intelligence and enforcement issues, can include importers, vendors, etc. These data are extremely useful for government and academic scientists, policy advisors, officers, and analysts who conduct research on species in trade, whether they be invasive, vectors of disease, endangered species, or species proposed for listing.

## **DISCUSSION**

The simulation demonstrates clearly that the AI technology used, the Nature Intelligence System, is significantly more effective than the procedures and technologies currently in place, which allowed 63% of the 70 commercial transactions to be released into Canada in error. The AI technology recognizes taxonomic names on commercial invoices and flags those species that are prohibited or regulated for BSOs. The AI technology links to multiple international taxonomic databases and essentially transfers scientific expertise to BSOs to enable informed, evidence-based decision-making at the border. The technology also has learning abilities, can flag anomalies or discrepancies and can also be adaptable to emerging concerns and new trends.

The information required to make an informed decision on a shipment is usually described in the commercial invoice and is sometimes also available on the manifest and in attached certificates, permits and licences. The problem is that the current systems and procedures do not allow BSOs to make decisions based on the key data, the scientific names of species. Furthermore, when information, such as scientific names, is missing on the import declaration, there is no trigger in current systems for BSOs to know when to request more information from the importer or customs broker. The information in declarations is also siloed, with species information on zoosanitary and phytosanitary certificates and Automated Import Reference System (AIRS) codes going exclusively to the CFIA, despite the information being extremely useful to the other departments and agencies.

The data generated (e.g., species lists, importer/exporter behaviour, interception data) are also critical to conducting risk and trade assessments. For example, DFO scientists conduct risk assessments for species in trade considered as potential aquatic invasive species, but not yet listed. A recent request for import records that include red swamp crayfish (*Procambarus clarkii*), could be accommodated easily by the NIS. Data on the species imported by importer, port of entry, quantity, origin, etc. can be generated rapidly (e.g. see species lists in Appendix 2) and be accessed directly by OGD scientists. Access to the data under the current systems is limited to electronic data generated from queries based on HS codes, however, as demonstrated in the Results section, there is a high error rate associated with HS code declarations. Seventy-four percent of transactions reviewed during this simulation had one or more HS



code errors. Not only are HS codes declared highly inaccurate, but most HS codes are not genus or species specific and encompass hundreds or thousands of species. For example, HS code 0301.11 describes live, ornamental, freshwater fish, under which tens of thousands of species would be classified. Also about one half of imports of aquarium and live seafood species are submitted on paper transactions and the species data within these records are not accessible. Consequently, the information generated from queries of CBSA's ACROSS and CCS systems is inadequate for comprehensive risk assessments.

ECCC has indicated that species trade data will allow scientists to better understand trade in non-listed wildlife species to identify those that need to be listed in CITES, but point out that there is no data source to identify species and volumes of trade of non-CITES listed species. Trade in IUCN red-listed species are of interest to ECCC scientists who do not have access to those data. For example, when seahorses (*Hippocampus* spp) were listed under CITES in 2004, it appeared that related species such as pipefishes, *Dunckerocampus* spp., which were detected in this simulation, were increasingly substituted in the aquarium trade. The IUCN lists [\*Dunckerocampus dactyliophorus\* as Data Deficient \(DD\)](#) and reports that there are no catch or trade volume estimates for *D. dactyliophorus* available. Without reliable international trade data, the status of species cannot be determined and the risks to those species that are harvested for trade continue unabated.

Inaccurate HS codes, as demonstrated for the transactions reviewed in the simulation, also lead to inefficiencies in targeting. The CBSA's National Targeting Centre (NTC) often develops targets, in large part, based on HS codes. One example of a target requested by the CFIA was that for a number of molluscs including the Small Giant Clam, *Tridacna maxima*, from French Polynesia. The target was based solely on HS codes for molluscs, including 0307.71, which would encompass the Small Giant Clam. The target was effected because molluscs from French Polynesia were thought to be vectors of *Perkinsus olseni*, a parasitic disease infecting molluscs that is not present in Canada. If this were to be introduced by way of importation of molluscs, the disease could devastate the oyster aquaculture industry as well as the mollusc fishing industries and possibly prevent future mollusc exports from Canada. Once introduced, the disease is impossible to eradicate. During this simulation, the NIS identified one import of *Tridacna maxima* from French Polynesia, and the HS code declared by the customs broker on the declaration was incorrect, 0308.90. If this had been imported during the target period (2014-2015), the target would not have hit.

Another example of targeting that is ineffective is that for moss balls, which can be infested with zebra mussels, a highly invasive species that is prohibited for import into Canada. On behalf of DFO, the NTC added targets for moss balls on specific importers in ACROSS, but these targets, being based on business numbers and HS codes, are not effective because they rely on the BSO to review import transactions and the expectation for BSOs to go through documentation for each import that may or may not include moss balls is not realistic. Note in the example in Figure 14, the HS code (tariff classification) used for the moss balls, 0604.20.10.90, is incorrect. The targets implemented for moss balls include only the correct HS codes; consequently they would not hit for this HS code. The NIS is

capable of searching every transaction (currently for aquatic species), regardless of importer, vendor or HS code and is clearly more effective at detecting prohibited species than targets entered in ACROSS.

The frequent mis-declarations of HS codes for many species of fishes, molluscs, crustaceans, other invertebrates, amphibians, and plants (see Table 6), make it clear that customs agencies cannot rely on HS codes for targeting, statistics, monitoring and interception of food, plant and animal goods at the border. The NIS is able to assign HS codes (in some cases to Chapter or heading levels) based on taxonomy. So, for example, species of marine algae, which are plants, and are often described by their scientific names only and frequently classified along with ornamental fish and invertebrates (0301 or 0308) are properly classified in Chapter 6, and thus can be detected easily and captured as plants by the NIS.

In summary, the CBSA and OGD partners lack the capability of monitoring and tracking importation of food, plants and animals. Furthermore, BSOs have little expertise on requirements for individual species and do not have time to consult the extensive number of policies and procedures developed by subject matter experts. They have to review each import declaration and make rapid decisions based on limited information as to whether to allow species into Canada. Despite their best efforts, the results of this simulation demonstrate that BSOs do release species into Canada that are invasive, can be vectors of diseases, and are endangered. These biosecurity gaps at the border can result in significant economic, societal and environmental costs, which exacerbate efforts to address climate change. Prevention costs, such as those proposed here, are on the order of 1,000 times less than the costs of responding to a disease outbreak, such as the COVID-19 pandemic, or to the introduction and rapid spread of an invasive species such as zebra mussels. The consequences of not allocating sufficient resources to prevention are staggering for FPA. The AI technology proposed here will address the problems identified; it has been tested in a simulated environment and is ready to be piloted.

## **RECOMMENDATIONS**

Based on the results and the input and comments by BSOs, SOTCs and OGDs, we recommend making this a Branch priority and moving the initiative to a pilot at selected ports of entry, for selected species, beginning with paper transactions, including those submitted via the electronic (E)-longroom. Teams discussions with all participants and the developers of the technology should continue and lead to a revision of the Dashboard making it more user friendly and easier to interpret for BSOs, SOTCs and OGDs. In addition, we recommend development of a short training module with standard operating procedures to be tested by those who participated in the simulation, followed by testing with a wider audience.

The FPA program, in PPMD, will work with the Border Technologies Innovation Directorate in Information, Science and Technology Branch, Commercial and Trade Innovation and Intake in Commercial and Trade Branch, the Innovation Management Office in the Chief Transformation Officer Branch, Environmental Operations in Finance and Corporate Management Branch, and with OGD partners to secure funding for IT specialists to implement the pilot.

## APPENDICES

### Appendix 1: Federal/Provincial/Territorial List of Regulations for Aquatic Invasive Species (AIS) and Susceptible Species (for Aquatic Animal Health [AAH])

#### Appendix 2: Species Lists

All species detected in NIS Simulation (see link below)

[https://www.flusty.solutions/NIS\\_Canada\\_Test.html](https://www.flusty.solutions/NIS_Canada_Test.html)

AIS species detected (prohibited by *Aquatic Invasive Species Regulations* and *Pacific Fishery Regulations* under the *Fisheries Act*, and / or by provincial legislation)

Scientific Name	Quantity	Number of Importers	Number of Shipments
<i>Clarias batrachus</i>	23	1	2
<i>Cyprinus carpio koi</i>	443	2	5
<i>Misgurnus anguillicaudatus</i>	115	1	3
<i>Procambarus clarkii</i>	8	1	1
<i>Tanichthys albonubes</i>	4,900	2	2
<i>Cladophora aegaropila</i> (moss balls)	200	1	1
<i>Eichhornia crassipes</i>	32	1	2
<i>Elodea (Egeria) densa</i>	120	2	4
<i>Pistia stratiotes</i>	32	1	2
<i>Cabomba caroliniana</i>	107	1	2

CITES species detected (subject to permit requirements under the *Wild Animal and Plant Trade Regulations* made under the *Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act*)

Scientific_name	CITES Appendix	Quantity (number)	#importers	#shipments
<i>Probarbus jullieni</i>	1	6	1	1
<i>Scleropages formosus</i>	1	50	1	1
<i>Acanthastrea</i>	2	26	2	5

Scientific_name	CITES Appendix	Quantity (number)	#importers	#shipments
<i>Acanthastrea echinata</i>	2	0	1	1
<i>Acipenser gueldenstaedtii</i>	2	150	1	1
<i>Acropora</i>	2	9	1	1
<i>Acropora millepora</i>	2	25	1	3
<i>Acropora samoensis</i>	2	6	1	1
<i>Acropora subulata</i>	2	1	1	1
<i>Acropora tenuis</i>	2	6	1	1
<i>Acropora valida</i>	2	6	1	1
<i>Astreopora</i>	2	5	1	1
<i>Blastomussa wellsi</i>	2	5	1	1
<i>Catalaphyllia jardinei</i>	2	5	1	1
<i>Cynarina lacrymalis</i>	2	5	1	1
<i>Echinophyllia</i>	2	19	1	5
<i>Euphyllia cristata</i>	2	16	2	4
<i>Euphyllia divisa</i>	2	24	1	5
<i>Euphyllia glabrescens</i>	2	26	1	6
<i>Euphyllia paraancora</i>	2	14	1	3
<i>Favia</i>	2	11	2	3
<i>Favites</i>	2	8	1	2
<i>Fungia</i>	2	6	1	2
<i>Fungiidae</i>	2	4	1	1
<i>Goniastrea</i>	2	3	1	1
<i>Goniopora</i>	2	14	1	3
<i>Homophyllia australis</i>	2	8	1	1
<i>Huso huso</i>	2	65 (kg)	1	1
<i>Hydnophora exesa</i>	2	2	1	1
<i>Leptoria Phrygia</i>	2	4	1	1

Scientific_name	CITES Appendix	Quantity (number)	#importers	#shipments
<i>Lobophyllia</i>	2	12	2	4
<i>Merulina scabricula</i>	2	7	1	2
<i>Montipora</i>	2	15	1	4
<i>Oxypora</i>	2	5	1	1
<i>Paragoniastrea australensis</i>	2	10	1	2
<i>Pectinia</i>	2	10	1	2
<i>Platygyra</i>	2	3	1	1
<i>Platygyra pini</i>	2	8	1	2
<i>Plerogyra sinuosa</i>	2	2	1	1
<i>Scleractinia</i>	2	553	2	7
<i>Scolymia</i>	2	1	1	1
<i>Strombus</i>	2	1021	3	8
<i>Trachyphyllia</i>	2	1	1	1
<i>Trachyphyllia geoffroyi</i>	2	12	1	3
<i>Tridacna derasa</i>	2	5	1	1
<i>Tridacna maxima</i>	2	41	1	3
<i>Tubipora musica</i>	2	7	1	3
<i>Turbinaria reniformis</i>	2	4	1	1
<i>Hypancistrus zebra</i>	3	210	1	2
<i>Potamotrygon henlei</i>	3	50	1	1

**AAH Species** detected (regulated under Health of Animals Regulations)

<b>Scientific Name</b>	<b>Quantity (#)</b>	<b>Number of Importers</b>	<b>Number of Shipments</b>
<i>Carassius auratus</i>	1,176	2	7
<i>Danio rerio</i>	900	3	7
<i>Poecilia reticulata</i> <sup>9</sup>	5,868	5	14
<i>Cyprinus carpio koi</i>	443	2	5
<i>Cyprinus carpio</i>	907 (kg)	1	1
<i>Tridacna maxima</i>	41	2	3
<i>Epinephelus lanceolatus</i>	3	1	2
<i>Paralichthys olivaceus</i>	219 (kg)	1	8
<i>Haliotis discus hannai</i>	110 (kg)	1	8
<i>Sebastes schlegeli</i>	4 (kg)	1	2
<i>Sesarma mederi</i>	400	1	2
<i>Mercenaria mercenaria</i>	6	1	1
<i>Cherax quadricarinatus</i>	12	1	1
<i>Procambarus clarkii</i>	8	1	1
<i>Macrobrachium lanchesteri</i>	40	1	1

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<sup>9</sup> Is not currently subject to AAH import requirements but was listed when the NIS Simulation was designed.

## Appendix 3. BSO and SOTC Comments on Use of the Dashboard and NIS

### BSOs

Dashboard is easy to use, but also hard to understand what I should be looking for - what do the colours mean? Maybe hyperlinks or information "I" icons to hover over to give a brief overview of what that line means

The dashboard is intuitive and easy to use. The red flags grab your attention from the start as it is the first thing you see when you open the platform.

The orange color for CITES appendix 2 species is a bit confusing, as I didn't understand why they were highlighted in orange before asking about it. I would recommend not to highlight it in orange, so that we keep the color coding to red (potential problem) and blue (no issues)

The orange highlight for AAH genus species - need more clarification as when the orange should be referred? As only scientific people distinguish between species- genus-order, etc.

The NIS is very easy to read with the Red boxes making it a quick reference notating there are some concerns.

This was still very easy to navigate, but I am not as well versed in the other subject headings and how it may impact my decision ie) Venomous/other Hazard, IUCN: Vulnerable. I am not certain if this is due to my lack of exposure with these documents/species at a land border.

This one was a little more complex for me. I did refer to CFIA as I could not locate any zoosanitary certificate. It would be my understanding that any live species coming in would require some form of health documentation.

Very clear, easy to reference and read

Red flags are easy to identify. However until you know which red flags mean a 100% referral and which red flags mean possibly take a further look, this could be confusing to a BSO using the system. Further clarity on when to email when an AAH species is listed in yellow would be helpful.

Comme l'exercice ciblait seulement les 2 cases d'en haut à gauche je n'ai pas porté attention aux autres "red flags", mais dans une situation réelle j'aurais eu plus de questionnement. Un fois à l'intérieur de la case "regulation" nous avons des espèces surlignées en rouge et d'autre de type "genus" surlignées en jaune. Cette ségrégation en couleur n'est pas claire i.e. devons-nous prendre action sur les espèces surlignés rouges seulement ou aussi sur elles surlignées en jaune? Il n'est pas clair non plus dans la directive qu'en à la relâche, à savoir si un renvoi à POC veut dire aucune relâche.

Un fois à l'intérieur de la case "regulation" nous avons des espèces surlignées en rouge et d'autre de type "genus" surlignées en jaune. Cette ségrégation en couleur n'est pas claire i.e. devons-nous prendre action sur les espèces surlignés rouges seulement ou aussi sur elles surlignées en jaune?

Dashboard phenomenal tool, very precise, but uncomfortable with it being too technical ; need training; lack of training could increase margin of error.

Shouldn't be up to BSOs to filter; this could be increasing their workload (it was explained that in this simulation, more than 50 % of the commercial invoices reviewed had to be referred, but this would not be the case during a live pilot when most of the entries will be recommended for release so this would actually save BSOs time, so they could focus on the high risk. Also when this goes live BSOs will not have to filter information, it will be RFI, release or refer).

Saves time by just having to click on button to send to OGD; with dashboard don't have to copy invoice, scan and send; so saves time that way.

When can we get this going live?

It would be improved with fewer boxes on the dashboard, don't require HS codes for BSOs, nor venomous species for BSOs or IUCN box; quicker and easier to determine

Clear indication that it should be referred

Will this work for EDI as well?

Reject, will it go back to the broker?

Suggested have separate tabs for BSOs, SOTCs, and OGDs

### SOTCs

It seems easy enough to use. No problems.

Easy to follow and good for matching common name with scientific name

I like the correlation between commercial invoice line with the dashboard and the colour coding which highlights what requires immediate attention; makes the reconciliation of invoice lines with the dashboard quite efficient and easy-to-use.

I do like the function where it can automatically search Google on a new tab when clicked. The scientific names of the fish or invertebrates etc. are not as obvious to me so being able to quickly search them by just clicking is very quick and simple.



## Appendix 4. OGD Comments on Use of the Dashboard and NIS

### CFIA Intel

CFIA being dependent on CBSA on the actual inspection phase at the POE, the NIS finds more direct application to BSOs than it does to CFIA inspection staff, the latter usually being consulted by BSOs on request.

The NIS would also find application for frontline CFIA inspectors who are participating in joint activities with BSOs at POE.

That stated, the NIS would be of benefit to the CFIA's National Import Service Centre (NISC), who seem to have been absent from this project.

Although CFIA ATL Area Intel took an interest in the NIS, we would not be primary users of the system as it is projected to be used. We do however believe that the system will shed light on the M/O utilized by some players/actors and allow us to identify trends, which will in turn assist us in directing operations to intercept illicit commodities.

Having had a limited appreciation of the NIS, it is clear that it's extremely useful in sifting through large amounts of data in a fraction of the time traditionally required and eliminates the need to peruse through 'white noise' data and focus on areas of concern.

The security of information concern was understandable and justified but it needlessly complicated the task of reviewing the referrals received by the BSOs. Had we had access to the live invoice and supporting documents available for viewing, it would have assisted the CFIA business line personnel in better addressing the referrals.

For CFIA, it must be stated that an integration to our various datasets, such as but not limited to IPS and AIRS 'guidance to BSO/CFIA Inspectors' on exemptions and exceptions, would have greatly alleviated much of the confusion on import requirements.

One of the recurring red flags referred to CFIA was for mis-matched identified country of origin for the species listed. This may need to be fleshed out in greater detail as there are complexities in comparing native, wild-caught vs. non-native farmed/cultured aquatic animals. Species distribution and country of origin should not be the sole determinant as these may be independent elements in captive-raised species.

### ECCC

Fully support CBSA's position on the shipment being non-compliant with respect to your legislation. NIS is predicated on the fact importers (and exporters) properly disclose the scientific name of the species. This is not only a customs requirement but is the basis for WED to conduct some of its own analysis on species when determining things like detection rate or compliance rate (i.e., how many

violations were seen in the total number of times a species was imported). Increased vigilance on proper reporting with support and enhance the enforcement of all agencies.

One thing to note is that without being able to examine the import/shipping manifests, our ability to make a decision on remote inspections is greatly hampered. I know Helen mentioned that these documents are available upon request but in our work, they are reviewed in the majority of the inspections. This is primarily because there are many times officer discretion plays a part in the determination if a shipment is detained or release or refused. It looks like there is a spot for “invoice image” so perhaps that is a later feature to be added but for now you will see that most of the actions are a “hold for inspection”.

Of course, this is determined in the absence of WED as a whole coming up with conditions that would warrant one action over another. For example, if any shipment arrives without a permit, hold for inspection. This type of criteria has always been tricky as sometimes not all the documents are shipped at the same time or in the same manner so there is a chance that (official) CITES permits arrive after the shipment. Nor does it allow for a WED officer to make a discretionary call to release a massive tropical fish shipment containing only a couple pieces of coral.

I like the ability to see what has been declared in the shipment via the website, but make a judgment call on what to do with it in the last couple examples is challenging.

- Chad and I think the use of the dashboard provides the BSOs and OGDs a useful portal to exchange information easily. Historically when receiving documents from CBSA they needed to be via secure line (i.e., fax machine) – Generally, some BSOs would email. So any officer conducting in-field operations at the time would need to return to the office or if close by, attend the airport for review. Once live, this system would allow the officer to review the file anywhere. Plus, the addition of a static copy of supporting documents in the sim system would speed up the review process.
- The advantages of the collated dataset for WED operations, RAD and intel could prove very fruitful. Consideration should be given to the drafting of a information exchange process that avoids the need for a 107 request should this system become operationalized.
- This system can help mitigate the effects of CBSA BSO turnover when dealing with CITES species. A routine consideration for WED is training of new officers or officers that have come from different departments. Removing the onus of learning CITES listed species or legislative provisions would be beneficial.
- The crux of the system is based on proper species declarations; this poses many challenges that will need to be monitored or addressed during the implementation, if needed
  - CBSA would likely need to launch some sort of education campaign on the strict new measures that would include proper labelling of the imports. Routinely species arrive into Canada under generic labels. For the system to function properly at all levels, those imports would need to be rejected until properly labelled with scientific names. The system cannot function if this step isn't consistently followed.
    - Con – once the importers, brokers, vendors, etc. understand that the system is based on ocular recognition software, it would be simple to defeat it by either not declaring the species or declaring a (non-regulated) look alike species.

- Counter measures and spot checks would need to be coordinated with OGDs and BSOs to target certain sectors on import. However, given the system is based on AI and learning from a large dataset, I have concerns that a lack of data during start up will make it challenging to properly target any one sector effectively.
- WED should consider the resource implications of the system should it be operationalized. In the short period of testing, there were importations with large volumes that required in-person inspections. Resource consideration should be given for areas of high commercial traffic. The ease of a referral by a BSO could lead to strain on resources for regions like Toronto, Montreal or Vancouver.

## DFO

The comments/feedback on the NIS system were that in general the system seemed very efficient and easy to use. The issues of using HS codes alone to identify potential AIS species are well documented and in particular many emerging threats fall under broad/general HS codes creating considerable challenges. The NIS system seemed to be a much better system to identify potential threats by not relying on solely on HS Codes. The Inspector App and Dashboard were intuitive, easy to navigate and potential AIS issues were clearly highlighted for DFO staff to review. The colour coding system was found to be easy to use and the ability to click on scientific species names within the shipment and automatically bring up additional information on the species was very helpful. It was suggested by one officer that it would be helpful for the relevant legislation prohibiting the species also be brought up when you clicked on the scientific species name within the shipment. When reviewing shipments referred to DFO it was found that the invoice image did not load, this feature would be helpful for reviewing officers. When additional information was requested by DFO the BSO's quickly forwarded the requested information and the use of email to send and receive referrals and additional information worked well.

In seven of the referrals sent to DFO species were highlighted using the "Regulation Flags" of "AAH/AIS Species" however the species were only listed under the Health of Animal Regulations and were not found under any direct AIS legislation. In these cases these shipments likely should have been sent to CFIA rather than DFO. The recommended course of action for these shipments was to refer the shipment back to CBSA and suggest it be forwarded to CFIA for review. Perhaps separate "Regulation Flags" should be made for "AAH Species" and "AIS Species" rather than combining the two to prevent this from occurring.

In a number of cases referrals to DFO contained species restricted or prohibited in certain jurisdictions of the country however no prohibitions existed in the jurisdiction where the import was entering Canada. An example of this would be where a shipment containing *Tanichthys albonubes*, which is prohibited under the British Columbia Controlled Alien Species Regulations, is imported into Ontario where no prohibitions exist for this species. These shipments were referred to DFO however there is no legislation preventing this shipment/action from occurring. Whether these shipments should be referred to DFO, simply be released or whether further review and additional information regarding the final destination of the product should be obtained from the importer (be that request come from a Fishery Officer, BSO or others) should be discussed. While this is not necessarily an issue with how the NIS system operates

this will likely be a common occurrence and it should be determined between CBSA and DFO how these shipments should be handled.

If the NIS system is implemented DFO will need to ensure that a system is developed internally to clearly identify prohibited/restricted species across the country, which pieces of legislation these species fall under and which agency (provincial or federal) is responsible for enforcing these pieces of legislation. Whether there should be a single email account for DFO-Imports at the national level to receive all referrals from CBSA or whether a different email account for each DFO Region should exist to receive referrals should be discussed as pros and cons exist for each. Regardless clear species lists and enforcement contacts will need to be set out so that staff reviewing the referrals can properly evaluate and forward information to the relevant contact. Realistic timelines and expectations for when Fishery Officers or provincial enforcement staff could arrive to inspect shipments if CBSA is requested to “Hold for Inspection” should be discussed.

Overall with the comments made above Fishery Officers who trialed the NIS system found it to be easy to use and effective at forwarding shipments with potential AIS risks to DFO.