Commission for the Conservation of
Southern Bluefin Tuna

みなみまぐろ保存委員会

CCSBT–CC/2610/18

Consideration of options for the development of a proof-of-concept for genetic testing during transhipments

1. Introduction

The Compliance Action Plan (CAP) sits within the CCSBT Compliance Plan and identifies the priority CCSBT compliance risks and agreed compliance actions to address these risks.

The CAP includes an action to:

> *"Consider the feasibility of transhipment observers taking tissue samples as part of the IOTC/ICCAT transhipment observer programmes and report back to the Compliance Committee" (Action 7C).*

This action has been agreed to help address risk 7; *SBT misreported as other (non SBT) species,* and the consideration by the Compliance Committee is scheduled to be completed in 2027.

There is currently limited information available to support the Compliance Committee to consider the feasibility of transhipment observers taking samples for genetic (DNA) testing. To help address this, the Twentieth Meeting of the Compliance Committee (CC 20) discussed the potential for the development of a small, targeted proof of concept for transhipment observers taking samples for genetic testing, specifically to inform the consideration of this by CC 22. The meeting noted that the collaboration agreement with IOTC (memorandum of understanding with FAO) was still yet to be agreed[1], so this meant that any trial of genetic testing could be discussed and agreed with IOTC as part of the discussions in defining the collaboration agreement.

During discussions, whilst recognising the benefits of genetic testing, Members noted the importance of considering the potential costs, funding arrangements, impacts on existing observer workloads, feasibility of sample collection and other practical considerations. CC 20 agreed for the Secretariat to develop an initial proof-of-concept to gain additional information on the potential for genetic sampling during transhipments and to continue engaging with IOTC on this matter.

The purpose of this paper is to provide an additional update to CC 21 on the options for undertaking a proof of concept for genetic testing by transhipment observers. If agreed, this proof of concept is intended to provide further information on which the CC 22 may complete its assessment of the feasibility of genetic testing to address CCSBT's agreed compliance risks.

[1] This MOU is still to be finalised due to further delays in the review and approval processes at FAO. See paper CCSBT-CC/2610/13 for further details.

2. Background

The 2021 CCSBT Performance Review noted the benefit of genetic testing in identifying unaccounted SBT mortalities during transhipments. The review report noted:

> *"A final issue related to SBT UAM was the possibly huge gap related to tuna transshipments at sea, due to the great difficulty to reliably identify SBT from physical characteristics, especially when looking at a frozen carcass. This means that whenever observers think they have detected non-reported transshipments of SBT at sea, it can never be proven (via photos). A possible solution to this problem, some suggested, would be the use of portable genetic testing (random), which is presently lacking." (Page 14)*

The benefits of genetic testing in transhipment monitoring have been recognised at many previous CCSBT meetings, including at the Eleventh Meeting of the Compliance Committee (CC 11) where the meeting strongly endorsed a Secretariat recommendation that:

> *"Members and the Secretariat should monitor developments in the effectiveness and availability of practical on-site genetic testing kits (for tuna species identification) so that any such tools developed can be considered for use by transhipment observers in the future and in the meantime look to collect samples for DNA analysis." (Paragraph 79 and Paragraph 133)*

CSIRO has developed and refined species specific DNA markers and assays for identification of individual Thunnus species and presented two papers to CC 11 that discussed genetic species identification of SBT in markets and a proof of concept for the use of biochemical techniques to estimate source ocean of SBT from tissue samples. These papers provided an early demonstration of the value of genetic sampling and biochemical analysis to, not only more accurately identify SBT, but also identify the source ocean.

Since this time CSIRO have undertaken further work to validate the markers for the full range of *Thunnus* species and genetic testing tools and preservation methods that can be effectively applied in field operations. This strategic program of work has pursued two avenues:

1. Species ID stick/cube: Development of novel DNA field device for species DNA identification. The CSIRO team have successfully demonstrated a proof-of-concept device that can extract and amplify DNA, run the assay to identify the species of DNA present, and visualise the result on a lateral flow strip (similar to a COVID test) without the need for a conventional PCR machine. The device has been designed to be easy to use, inexpensive and explicitly for field identification (fishing vessel, transhipment, port, inspections). This work is in the next stage of technical and business development and is expected to be available for wider field trials in the next 12-18months.
2. Commercially available desktop kits: As a parallel implementation pathway CSIRO has reviewed and evaluated commercially available, cost-effective desktop polymerase chain reaction (PCR) and lateral flow strips for visualising test results using the DNA markers and assays developed by CSIRO. Suitable combinations of existing technology have been undergoing testing and refinements to work consistently with the CSIRO assays and markers and provide an alternative field kit that meets specific application requirements. These kits are a viable option that can be considered for a CCSBT demonstration trial to assess the potential for genetic sampling during transhipments. The PCR kits are discussed further in the sections below, along with key considerations around the recommended collection protocols.

As noted, CSIRO are continuing to develop rapid in-situ DNA testing tools, but these require further testing and completion of Beta-development prototypes before they are expected to be available for broader testing and eventual use. The rapid in-situ tests are therefore not considered as an option that is currently available for a possible CCSBT trial. However, a further update on the development of the rapid in-situ DNA testing tools is provided for Member information in **Attachment D** of this paper.

The desktop PCR kits offer a cost effective and readily available option (from a range of commercial suppliers globally) for conducting genetic sampling and these are discussed further in the following sections.

3. Key Considerations for Genetic Testing by Transhipment Observers

When considering the feasibility of transhipment observers taking genetic samples, the locations at which observers embark and disembark carrier vessels needs to be considered. This is because, with rapid in-situ genetic testing tools not being ready for operational deployment at this stage, the observers will need to be provided with equipment for taking samples at sea, and the samples taken will also need to be sent to a defined location for testing. This will either be an appropriate testing laboratory or a location where the equipment for PCR testing is held and can be used by people that have been appropriately trained to use these kits.

With the genetic samples being considered biological material, the samples can be subject to biosecurity restrictions when transported across international borders. This can add additional complexity, cost and risk to any genetic testing programme. It is also more difficult to ensure the safe transport and preservation of the samples, where they may require independent transportation.

It is easier to send the equipment required by the observers to obtain the genetic samples prior to the deployments, than it is to send the genetic samples themselves. It is therefore recommended that, if Members choose to progress with the proof of concept, that a single location is selected for this programme where samples can be obtained from the observers and testing of the samples conducted. This location should ideally be one that is accessible to ports in which transhipment observers disembark carrier vessels, or that carrier vessels may call into during voyages (where samples can be obtained from the observers). It will also need to have the capability to test genetic samples and accurately identify species. The discussion that follows focusses on the use of the PCR kits that have been undergoing testing and refinements to work consistently with the CSIRO assays and markers. These kits are further explained in Section 4 and **Attachment C** of this paper.

3.1. Embarkation and Disembarkation Ports for CCSBT Observer Trips

The Secretariat has reviewed the locations of embarkation and disembarkation of transhipment observers on trips where SBT is transhipped during 2024 and 2025. The Secretariat has also reviewed the port calls that the carrier vessels made during these observed trips. The vessel tracks of the CCSBT authorised carrier vessels that conducted SBT transhipments during 2024 and 2025 are shown in image 1 and image 2 below.

Image 1: Authorised Carrier Vessel Tracks for Carrier Vessels that Conducted SBT Transhipments 2024

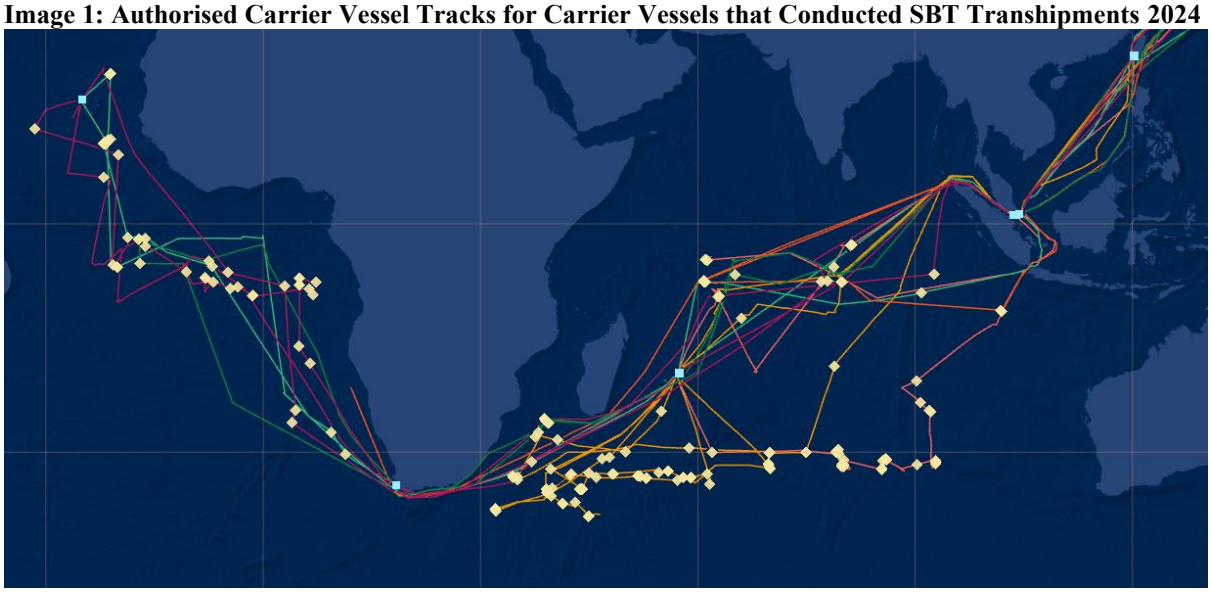
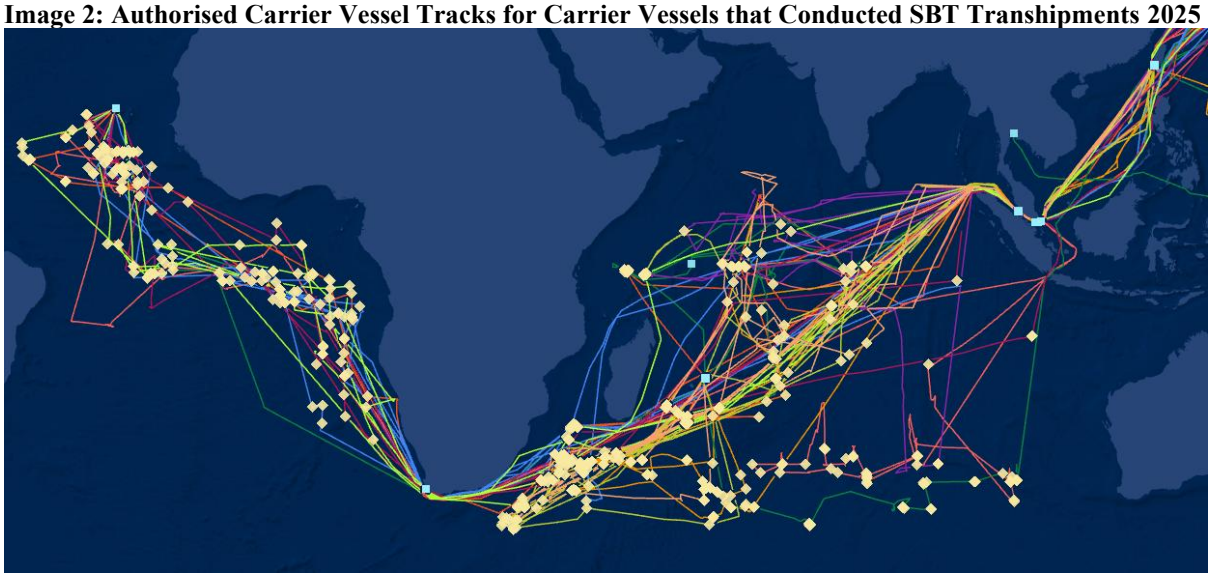


Image 2: Authorised Carrier Vessel Tracks for Carrier Vessels that Conducted SBT Transhipments 2025



As these images highlight, the overall carrier vessel voyages commence and terminate in ports in East Asia, with ICCAT and IOTC observed trips often being completed on the same voyage. Singapore is the most common location for the transhipment observers to embark (69% of trips in 2025 and 67% in 2024) or to disembark (62% of trips in 2025 and 83% in 2024) the carrier vessels.

When considering ports within the CCSBT Membership, Observers disembarked carrier vessels in Cape Town, in both 2024 (one trip) and 2025 (two trips), and in Kaohsiung (two trips in 2025). In addition, carrier vessels will sometimes conduct port calls in Cape Town, especially between IOTC and ICCAT deployments. However, it is important to note that port calls and locations for embarkation and disembarkation, particularly where there may be more than one observed trip during a voyage, will be influenced by the operational requirements of the fishing and carrier vessel and may be subject to change.

3.2. Consideration of Possible Testing Locations

The most important consideration for identifying a suitable testing location, along with cost and access to genetic samples, is the expertise and ability to test samples and accurately identify species. As noted earlier in the paper, CSIRO has reviewed and evaluated commercially available, cost-effective desktop polymerase chain reaction (PCR) and lateral flow strips for visualising test results using the DNA markers and assays developed by CSIRO. These kits provide a viable option that can be considered to support a CCSBT

demonstration trial to assess the potential for genetic sampling during transhipments. This means that, with the appropriate training on use of the PCR kits, genetic testing that draws on CSIRO's expertise in this area can then be completed in other locations. Provided this is a location with direct access to transhipment observers, either following or during trips, this can be achieved without the samples being required to be sent across international borders.

The Secretariat recommends that the most appropriate location for the testing to occur would be Cape Town. As well as being a port located within a CCSBT Member that has CCSBT authorised carrier vessels call in port, CapFish / CapMarine has offices and staff located in Cape Town. CapFish / CapMarine is part of the consortium (along with MRAG UK) that provides the regional observer programme (ROP) services for IOTC and ICCAT.

Engaging CapFish / CapMarine in the proof of concept[2] would provide a suitable location for testing genetic samples using staff to undertake the tests that are already engaged in providing ROP support services. In addition, Cape Town is a location where in-port transhipments of SBT can also occur.[3] This could also provide the option of utilising in-port transhipments to test the PCR technology in the proof of concept. Incorporating in-port transhipments could also provide a cost-effective option to supplement the at-sea testing, should any logistic issues make the utilisation of at-sea sampling more challenging.

Initial discussions have been undertaken with the IOTC / ICCAT ROP consortium partners and further information on these discussions is included in **Attachment A** to this paper.

3.3. Collection Protocols

Noting that, if agreed, this would only be a proof of concept, the samples collected are not proposed to be used in any evidential or compliance processes. However, it is still important that clear and effective sample collection processes are followed to protect the integrity of the samples and any subsequent tests completed. Australia has been active in using DNA sampling as part of its fisheries inspection regime and also led the development in 2025 of the WCPFC's Voluntary High Seas Boarding and Inspection Regional Guide on DNA Sampling. So, when considering defining an effective process for obtaining DNA samples, the WCPFC voluntary guidelines, and processes developed by Australian authorities can be used to inform this process.

Some recommended elements for collection protocols for a taking and preserving tissue samples from SBT as part of a proof-of-concept trial are included in **Attachment B** to this paper.

4. Desktop PCR Kits for Testing Genetic Samples

4.1. Accuracy

The accuracy of the DNA tests relies on the uniqueness of the markers (to the species) variation in the markers among individuals and the consistency of the amplification/assay/visualisation process in confirming the presence/absence of the DNA marker. CSIRO has identified markers that are unique to each species and/or a subset of species (e.g. bluefins) and developed a suite of assays that can be applied to different specific questions. The accuracy of these marker/assay combinations is high, with the field tests having a slightly lower accuracy than laboratory tests based on a separate set of next generation sequencing SNP markers.

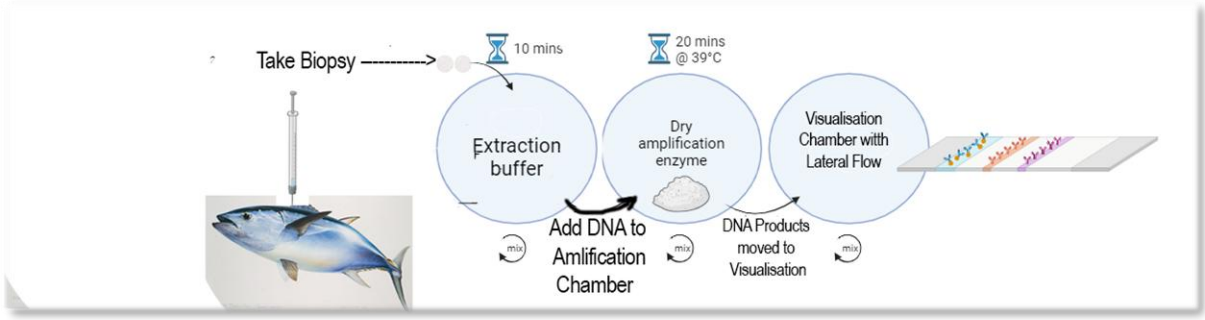
4.2. Operational Requirements

[2] Noting that further discussions are required and there has been no formal commitment at this stage.
[3] There were nine (9) in-port transhipments of SBT undertaken in Cape Town in 2025, and there have been four (4) in-port transhipments of SBT undertaken in Cape Town undertaken thus far in 2026.

The sampling and DNA processing protocols are relatively simple and straightforward and have been designed to be implemented by field staff with a minimum of training. They do not require any more than a conceptual understanding of the 4 steps in technical process illustrated in Figure 1:

i. Tissue biopsy
ii. DNA extraction
iii. DNA amplification
iv. Visualisation of result.

Figure 1. Four step protocol from tissue biopsy of fish to species identification.



Each of these four steps is described in more detail in **Attachment C** to this paper.

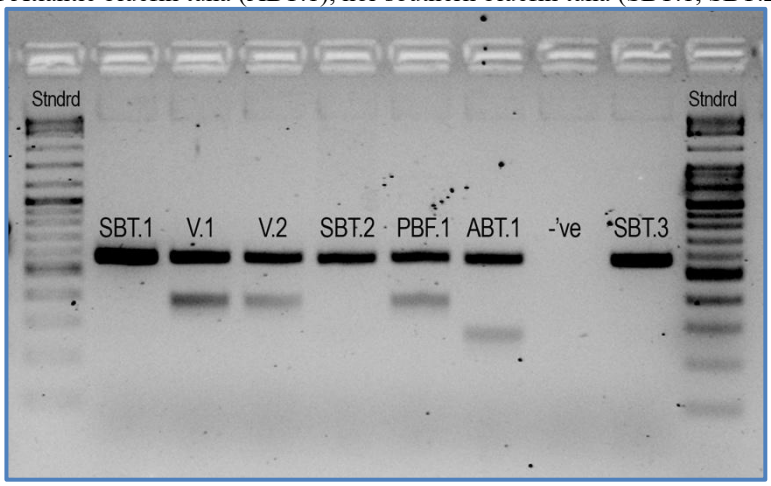
4.3. Potential Costs

Table 1 provides a summary of indicative costs associated with each component of the testing kits proposed for use in the demonstration trial of the species identification protocol. The most expensive component is the portable PCR machine, and the range of costs there reflect the different forms of commercially available machines that are compatible with the CSIRO protocols. Preliminary quantities and costs of consumables for the trial are provided in table 2.

Table 1: Indicative Costs for the Testing Components

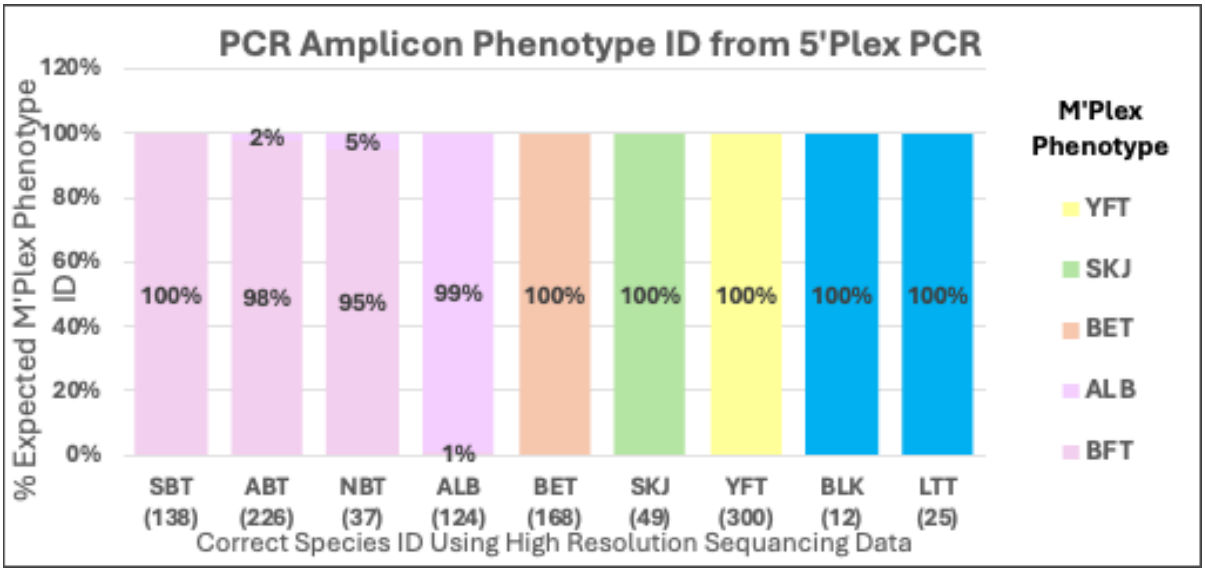
Item	Indicative Unit Cost (AUD)
Biopsy Punch	$5.00
Forensic DNA paper	$3.50
DNA Extraction	$5.00
Amplification - Portable PCR machine	$5,000.00 - $8,000.00
Amplification – consumables/test	$4.00 - $7.00
Visualisation - Lateral flow strips	$6.50

Figure 2. DNA fingerprint results from species specific PCR testing show the two samples from a large bluefin caught in Victoria (V.1 and V.2) matched the DNA pattern of Pacific bluefin tuna (PBF.1) and neither diagnostic pattern of Atlantic bluefin tuna (ABT.1), nor southern bluefin tuna (SBT.1, SBT.2, and SBT.3).



Diagnostic patterns of species-specific DNA markers visualised by gel electrophoresis is shown in Figure 2. These markers and assays have been validated against a large number of 200+ individuals for each commercially important tuna species (ABT, ALB, BET, PBF, YFT, SBT, SKJ) shown in Figure 3.

Figure 3. Rapid multi-plex PCR results compared to high resolution sequencing for species identification. Due to intraspecific variation in the markers, 2% of ABT and 5% of NBT(PBF) are misclassified as ALB and only 1% of ALB are misclassified as SBT[4].



Furthermore, they have been converted to assays that run on DNA test strips ($6.5 per sample) to deliver inexpensive, rapid and forensic grade species identification patterns much like a Covid RAT test. The lateral flow strips are used to provide a similar banding pattern result from the DNA product from the kit. DNA amplification via PCR remains the most robust strategy and these devices can typically be purchased for less than $10k AUD. Three commercially available and more easily portable equipment options have been identified that use mini-PCR (regular Polymerase Chain Reaction), qPCR (quantitative fluorescent PCR), and Isothermal amplification technologies. These options, when combined with the CSIRO DNA marker, would meet CCSBT's short-term requirements for DNA amplification as part of a proof-of-concept study and demonstrate the ease of use in routine situations under the current ROP arrangements.

Table 2: Preliminary Quantities and Costs of Consumables

Consumable	1x	100x
Biopsy punch	$5	$500
Forensic card	$3.5	$350
DNA extraction	$5	$500
DNA amplification	$4	$400
DNA lateral flow sticks	$6.5	$650
Totals	**$24**	**$2,400**

A commercially available desktop kit, with sufficient consumables to conduct 100 DNA tests, would cost between approximately $7,400 and $10,400 AUD. To provide Members with the opportunity to further assess the technical methods underpinning this approach, a

[4] In the case where the rapid field identification indicates a bluefin species, final very high confidence identification can be done with next generation sequencing, if that level of confidence is required.

report on the proposed approach can also be presented to the Extended Scientific Committee for the Thirty-Second Meeting of the Scientific Committee (ESC 32).

5. Engagement With IOTC

As directed by Members, the Secretariat has continued to engage with IOTC since CC 20 on this work. The IOTC data and science department are planning a regional sampling project for tuna and sharks in the coming years, which includes a genetic sampling component. IOTC recognised some opportunities for collaboration in this work, although noted that most genetic studies are conducted by IOTC member organisations and directed the Secretariat to MRAG and these organisations for further discussions in the short term. The Secretariats continue to seek opportunities for further information exchange on this work, and the CCSBT Secretariat will continue to inform IOTC of developments if, or as, this work progresses.

6. Summary

The Secretariat believes that, based on information obtained and consultation completed to date, there is no technical barrier to develop a targeted and cost-effective trial to assess the feasibility of transhipment observers taking tissue samples as part of the IOTC/ICCAT transhipment observer programmes. However, additional work is needed to further define the scope of the testing, specific requirements (including of partners in any trial agreed) and associated costs and details of field protocols.

It is recommended that further work be undertaken to develop a proof-of-concept for genetic testing during transhipments and this be based on a trial:

- using commercially available, cost-effective desktop PCR machine and lateral flow strips for visualising test results using the DNA markers and assays developed by CSIRO;
- having the testing of genetic samples integrated, to the degree possible, with the ROP management and undertaken in Cape Town, South Africa; and
- utilises both in-port transhipments (coordinated with the flag CCSBT Member) and trial at-sea transhipments during observer deployments.

With Members approval, a detailed project plan, based on these parameters and including clearly defined costs, could then be presented to CC 22 for consideration.

7. Recommendations

The Secretariat invites Members to:

- Note the progress in development of rapid in-situ genetic testing tools by CSIRO, but that this requires further technical development before any broader testing can be completed;
- Discuss the information provided in the paper on the recommended options for the development of a proof-of-concept for undertaking genetic testing during transhipments;
- Task the Secretariat to continue work (with potential partner organisations) to develop a defined project plan for a proof-of-concept for genetic testing during transhipments for consideration by CC 22; and
- That this project plan be based on the trial:
    - using commercially available, cost-effective desktop PCR machine and lateral flow strips for visualising test results using the DNA markers and assays developed by CSIRO;
    - having the testing of genetic samples integrated, to the degree possible, with the ROP management and undertaken in Cape Town, South Africa; and

- utilising both in-port transhipments (coordinated with the flag CCSBT Member) and trial at-sea transhipments during observer deployments.

Prepared by the Secretariat

Attachment A
Consideration of the Testing Location

Initial discussions have been undertaken with the IOTC / ICCAT ROP Consortium partners. The purpose of these discussions was to make the organisations aware of CCSBT's work to consider the viability of a proof of concept for genetic testing by observers and to get input on any specific considerations from the ROP for this. Insufficient details were available at this time on the PCR kits and the specific requirements for undertaking the testing to allow for detailed discussions. Therefore, no specific requirements of CapFish / CapMarine (if the trial went ahead) were able to be discussed, including any costs associated with housing and undertaking the testing at the CapFish / CapMarine office. However, during these discussions the following points were noted:

- CapFish / CapMarine has staff members that have undertaken genetic sampling and/or facilitated the export of genetic samples (from other fisheries) to test laboratories before;
- The CapFish / CapMarine offices were viewed as a suitable location for the testing to be undertaken (based on the information available at the time);
- The collection of genetic samples by CapFish / CapMarine observers was practically very achievable, with a lot of observers already experienced in robust sampling processes;
- Durban, Port Elizabeth and Cape Town were seeing more in-port transhipments of large pelagic vessels;
- There were logistical challenges around the genetic sampling, principally around getting samples from the locations that the observers disembark carrier vessels. But CapFish / CapMarine observers can disembark in Cape Town; and
- It was felt that if a CCSBT Member was willing to support the proof of concept to help coordinate access to vessels for sampling and ensuring these could be delivered to the testing location then this could also help overcome some of these logistical issues.

Based on these initial discussions, it is felt that Cape Town would be a viable location to conduct the testing of genetic samples that may minimise some of the logistical challenges in getting the samples to testing locations.

Attachment B
Recommended Components of a Sample Collection Protocol

Considering the WCPFC's Voluntary High Seas Boarding and Inspection Regional Guide on DNA Sampling and processes developed by Australian authorities, the Secretariat has identified the some key considerations related to the collection of samples for genetic testing.

It is therefore recommended that collection protocols include the following:

- To prevent cross contamination, the observers shall:
  - Use new or unopened sampling tools;
  - Use new or unopened sample containers/tubes to store the samples; and
  - Wear single-use disposable gloves.
- When taking genetic samples, observers shall;
  - Complete documentation that should record the details of the sample taken that includes at a minimum:
    - Date and time of the collection;
    - Collectors name;
    - Carrier vessel details, including name and CCSBT authorisation number;
    - Unique sample identification number;
    - location of fish sampled (e.g. blast freezer, hold number);
    - description (reported species and processed state of fish); and
    - CCSBT tag number (if/where available).
  - Take at least two tissue samples from the fish[5].
  - Take tissue samples, to the extent practicable, from the commercially least valuable part of the fish, such as the tail.
  - Collect, label, preserve and seal each tissue sample separately.
  - Label each tissue sample with the following minimum details on the sample labels:
    - Date
    - Unique sample reference number
    - Vessel name
    - Collector name
    - CCSBT tag number (if/where available)
  - Store the samples safely and in a manner that will ensure that they are secure and there is no potential for contamination of the sample (e.g. breakage of the sample containers/tubes).

[5] The WCPFC Guidelines recommend taking three samples, but as the CCSBT Proof of Concept is not seeking to collect evidential samples, it is suggested that two samples will be sufficient.

i. Tissue Biopsy (and DNA preservation, where applicable)

CSIRO has trialled and tested different tissue collection protocols that build on the lessons learnt from the development of the Gene-tag tool (GTT, Bradford et al 2016[6]) that has been the foundation of the gene-tagging program for CCSBT (Preece et al 2026[7]). The key considerations are ease of use and ergonomics, ability to sample fish frozen to -40-80 degrees and minimising/eliminating the potential for cross contamination of tissue/DNA between fish/samples.

While the GTT is suitable for sampling fresh and frozen samples down to ~ -10 degrees, it is not suitable for fish at -40-80 degrees on fishing or transhipment vessels or in port, as the replaceable the plastic tips are not strong enough. For these purposes we have demonstrated a commercially available surgical tissue punch that will penetrate the frozen tissue and provide a single plug of tissue. Depending on the application, this tissue plug may be placed in an Eppendorf tube along with some suitable buffer/fixative or it may be smeared across forensic grade paper that fixes the DNA at room temperature.

The advantage of forensic grade paper fixative is it is inexpensive, simple and easy to use and does not present any food safety issues if being used on vessels or in processing facilities. Furthermore, a simple paper hole punch can then be used to take one, or more, samples of a relatively standardised DNA quantity from the forensic paper and be used directly in the DNA extraction protocol. This method provides multiple copies of the same tissue for DNA extraction on-site and the remainder can be sealed in an evidence bag, as part of a chain of custody in cases where subsequent testing with the same individual, or additional higher confidence DNA sequencing is required.

ii. DNA Extraction

This step is easily achieved using commercially available DNA extraction kits and the simple vials and consumables supplied with them. A predetermined quantity of the extracted DNA product is transferred to the amplification stage, for example the amplification tube in the Mini PCR machine.

iii. DNA Amplification

The predetermined quantity of DNA product is added to the amplification used in the PCR machine along with prefilled amplification chemicals, including those required for the species identification. This is longest stage of the process as it involves a necessary number of "cycles" at specific temperature to generate the species-specific DNA products. Upon completion of the PCR cycling, a predetermined quantity of the amplified DNA PCR products are transferred to the lateral flow strip (effectively the same as used in a Covid/pregnancy test).

iv. Visualisation of Results

The DNA products placed on the lateral flow strip wick their way up the strip and, depending on the content of the DNA product and the specific test being used, they bind with the different test lines on the strip. CSIRO has developed a range of these for application in different contexts. For example, in the simplest case a bluefin-test could

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[6] Bradford, Russell & Hill, Peta & Davies, Campbell & Grewe, Peter. (2016). A new tool in the toolbox for large-scale, high-throughput fisheries mark-recapture studies using genetic identification. Marine and Freshwater Research. 67. 1081-1089. 10.1071/MF14423.

[7] Preece AL and Eveson JP. (2026) Gene-tagging proposal 2027-2029. Prepared for the Thirty-First Meeting of the Extended Scientific Committee. August 2026, Brussels, Belgium. CCSBTESC/2608/1

have two lines: i) a positive control that confirms there is good quality DNA from the species in the DNA extraction and, ii) if the DNA is from a one of the three bluefin species, a second band is also present. If the second band is absent, then it is not bluefin, but that is the extent of the information you have from this test.

Depending on the objective of the testing program, you could have a lateral flow strip with three test lines that will deliver information on three species as well as a true positive control test line assay similar to the PCR results shown in figure 2 which distinguishes between the three bluefin species. In this case, there would be one line for a positive control and a second line to indicate Pacific bluefin tuna, and the third line to indicate Atlantic bluefin. If the second and third lines are missing, then the fish is an SBT. A more informative test in the context of the Indian or Pacific Oceans would be a four-line test with:

a) Test line 1 as positive control;
b) Test line 2 as Atlantic, Pacific or Southern Bluefin;
c) Test line 3 as yellowfin; and
d) Test line 3 as bigeye.

In this case, you would know from this initial analysis whether the fish is a bluefin or one of the main tropical species. A separate three or four-line test could then be used to distinguish between the three bluefin species, if the bluefin line was positive. At present the number of species that can be consistently and robustly combined in a single amplification and visualisation process is the limiting factor on the number of species that can be unambiguously included in one test. CSIRO's current validated test discriminates 5 species (Bluefins, ALB, BET, SKJ, and YFT) in a single amplification tube plus a positive DNA control.

Attachment D
Update on the Development of Rapid In-situ Genetic Testing Tools

Development of a tool that can deliver rapid species identification in a field situation requires the ability to complete the same four key tasks shown in figure 1:

i. Tissue biopsy;
ii. DNA extraction from samples;
iii. DNA amplification of validated species-specific targets; and
iv. Target visualisation and analysis to reveal the result.

CSIRO has developed protocols that address all four steps and demonstrated a proof-of-concept device that combines these steps into a single device in less than an hour. The proof-of-concept device is approximately half the size of a smart phone but requires external equipment to control the sequencing of reactions. Removing the need for these external controls is a key objective of the next stage of development.

This next stage is focussed on making this an inexpensive field deployable device, a simple "lab-on-a-chip" (LOC) cartridge, capable of high accuracy discrimination among the relevant commercially important species of tuna for specific field/operational applications. This LOC would be operated with minimal skillset, such as that required to run a Covid RAT tests available at most chemist shops.

As noted earlier in the paper, this work is in the next stage of technical and business development and is expected to deliver a beta-stage prototype for wider field trials in the next 12-18months. It is therefore not considered a viable option for a possible CCSBT proof of concept at this stage.