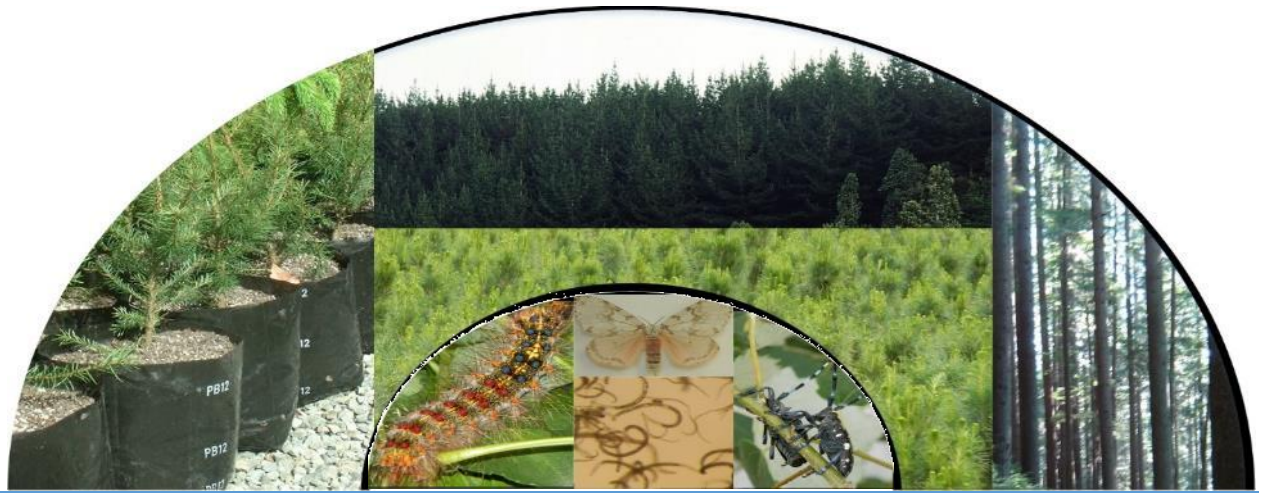

International Forestry Quarantine Research Group

International Meeting # 21

November 4 - 8, 2024, Rome, Italy

Meeting Report

NOVEMBER 18, 2024

INTERNATIONAL FOREST QUARANTINE RESEARCH GROUP

SCIENCE STEERING COMMITTEE

https://www.ippc.int/en/external-cooperation/organizations-page-in-ipp/internationalforestryquarantineresearchgroup/

Meeting Report

This meeting report communicates the discussions and conclusions from the 2024 annual meeting of the International Forestry Quarantine Research Group. The meeting was held 4th to 8th of November 2024.

Disclaimer

Recommended citation:

IFQRG (2024) Report of the 2024 Meeting # 21 of the International Forestry Quarantine Research Group. November 2024, Rome, Italy. International Forestry Quarantine Research Group.

1. Opening of the meeting

1.1 Welcome Address -

Michael Ormsby (IFQRG Chair), opened the meeting and welcomed all participants. Eric Allen kindly offered to Chair the meeting and welcomed the group to Rome and gave a brief outline and the background history of International Forestry Quarantine Research Group (IFQRG) and described how the meeting agenda is rolling and subject to change with additional presentations throughout the week according to the discussion and need for additional information. Chris Howard kindly offered to Chair the second half of the meeting.

2. Meeting Arrangements

Eric Allen provided information about the meeting, rooms and logistics of the meeting and area: 05_IFQRG_2024_Info.

2.1

Brad Gething offered to serve as rapporteur.

The meeting agenda was reviewed and adopted by participants: 01_IFRQRG_2024_Agenda

2.2 Meeting Agenda

	AGENDA ITEM	DOCUMENT NO.	PRESENTER
1.	Opening of the meeting		
	- Opening remarks by the IFQRG Chair		ORMSBY
2.	Meeting Arrangements		
	- Election of Meeting Chair - Election of the Rapporteur - Adoption of the Agenda	01_IFQRG_2024_Agenda	ORMSBY/ ALLEN ALLEN/ NOSEWORTHY
3.	Administrative Meeting Information		
	- Documents List - Presentation Abstracts - Local Information - Participants List	03_IFQRG_2024_Doc 04_IFQRG_2024_Abs 05_IFQRG_2024_Info 06_IFQRG_2024_Part	ALLEN/ NOSEWORTHY
4.	Working groups list[1]		
	- IFQRG 2023 Proceedings	07_IFQRG_2024_Proceedings 2023	ALLEN/ ORMSBY
5.	Updates		
5.1	International Plant Protection Convention (IPPC) report		NERSISYAN
5.2	European and Mediterranean Plant Protection Organization (EPPO): An update on activities in the field of forest quarantine		MUSOLIN
5.3	Technical Panel on Phytosanitary Treatments (TPPT) report		SHAMILOV/ STIRLING
5.4	Asia and Pacific Plant Protection Commission/ Pacific Plant Protection Organization, APPPC/ PPPO report		ORMSBY
5.5	North American Plant Protection (NAPPO) - Forestry projects report		NOSEWORTHY/ MACK/ UZUNOVIC
5.6	The Global Alliance for Plant Health Quint Collaboration projects overview/ Methyl bromide alternatives working group		MACK
6.	Research to support the development of international standards for phytosanitary measures (ISPMs) for plant protection		
6.1	Report on the ISPM 15 workshop with the EU-member states in Germany 2023		SCHRÖEDER
6.2	The continued downtrodden reputation of ISPM 15		HOWARD

	AGENDA ITEM	DOCUMENT NO.	PRESENTER
6.3	NAPPO Project - Risk categorization for wood packaging materials		NOSEWORTHY/ ALLEN/ MACK
6.5	Global movement of wood		ORMSBY
6.6	ISPM 28 and ISPM 15 treatment submissions requirements		ORMSBY
Virtual Session – Tuesday November 5th – Day 2 – 14:00 to 17:00 PM CET			
7.	Launch: Guide to implementation of phytosanitary standards in forestry – Second Edition		
7.1	Opening Remarks from Deputy Director of FAO Forestry		RAMETSTEINER
7.2	Impact of the "Guide to Implementation of Phytosanitary Standards in Forestry"		ALLEN
7.3	Looking forward		SCHRÖEDER
7.4	Closing remarks		ONE HEALTH
7.5	Moderation		CANO MARIMON
8.	Molecular Tools		
8.1	The IFQRG Molecular Tools Working Group: Working towards recommendations for molecular tools for identification of pests on forest products in trade		DALE
8.2	The iTrackDNA Project: Enhancing Forestry Industry Sustainability with Environmental DNA		HELBING
8.3	Application of Biomolecular Approaches for Tracking the Efficacy of Phytosanitation Measures Against the Pinewood Nematode in Wood Products		THOMPSON
8.4	A Case Study in Developing Molecular Assays for Detecting Live and Dead Pinewood Nematodes in Wood Products		LEE
8.5	Genomics at our service: development of point-of-care diagnostic assays for forest pathogens		FEAU
8.6	IPPC diagnostic protocols and diagnostics for pests of forest products		MOREIERA
8.7	Recap of virtual discussion on Day 3		HELBING
End of Virtual Session – Tuesday November 5th – Day 2 – 14:00 to 17:00 PM CET			
9.	Phytosanitary challenges and treatments		
9.1	Recap of Day 3		HELBING
9.2	Forest pests heat treatment research - specific lethal doses for wood borers and fungal pathogens		NOSEWORTHY/ DALE

	AGENDA ITEM	DOCUMENT NO.	PRESENTER
9.3	A preliminary tolerance screening of wood-infecting fungal species submitted to treatment temperatures recommended in ISPM 15		HENIN
9.4	Research on pine wilt disease in China		LI
9.5	Dielectric heating certification in North America		MACK
9.6	Vacuum pressure impregnation (VPI) with wood preservatives to eliminate pinewood nematode from wood		VERDASCA
10.	New tools, technology and research		
10.1	Surveillance and detection of potentially harmful organisms using long-read sequencing tools in forest pathology		ORBACH
10.2	The assessment of tree seed mycobiomes using Illumina and Nanopore metabarcoding and traditional plating		FRANIC
Virtual Session – Thursday November 7th – Day 4 – 14:00 to 17:00 PM CET			
11.	Phytosanitary measures and guidance for wood chips		
11.1	EPPO standard for monitoring and consignment inspection of wood chips, hogwood and bark for quarantine pests		EYRE
11.2	EPPO Guidance document for managing the risks associated with international trade in wood chips		MUSOLIN
11.3	Definition, production, markets & trade of wood chips		HENIN
11.4	Phytosanitary risks and quarantine pests associated with wood chips		UZUNOVIC
11.5	Treatments/ measures/ management practices for wood chips to eliminate and manage pest risk in international trade		HENIN/ MACK
11.6	Systems approaches to reduce pest risk in international trade of wood chips		NOSEWORTHY
11.7	Regulator and industry perspectives on wood chip trade		HOWARD
11.8	Working group discussion		ALL
End of Virtual Session – Thursday November 7th – Day 4 – 14:00 to 17:00 PM CEST			
12.	Other Business		
12.1	Recap on virtual discussion on Day 4		CHAIR
12.2	Future research needs discussion		CHAIR

	AGENDA ITEM	DOCUMENT NO.	PRESENTER
13.	Other business		ALL
14.	Review and finalize proceedings Plan next meeting		ORMSBY/ NOSEWORTHY
15.	Close of the meeting		CHAIR

3. Administrative Meeting Information

3.1 Document list: 03_IFQRG_2024_Doc

3.2 Presentation Abstracts: 04_IFQRG_2024_Abs

3.3 Introductions

IFQRG participants introduced themselves and described their work and history with IFQRG. The participant list is appended to this report and found in the IFQRG work area 06_IFQRG_2024_Part.

The participants group photo and IPPC News pieces on the IFQRG 21 Meeting were published Nov: https://www.ippc.int/en/news/science-and-collaboration-to-support-healthy-forests-and-phytosanitary-standards-the-international-forestry-quarantine-research-group-ifqrg-21st-annual-meeting/

4. Working groups list[1]

The molecular tools working group membership and meeting reports are documented in the IFQRG work area.

The IFQRG 2023 Proceedings are on the public IFQRG page: 07_IFQRG-2024_Proceedings_2023.

5. Updates

5.1 International Plant Protection Convention (IPPC) activities update

Avetik Nersisyan (Standard Setting Unit Leader, IPPC Secretariat)

Avetik Nersisyan gave an update on IPPC activities and current status of the Secretariat. Highlights of IPPC focus areas include, One Health, climate change, E-Phyto, and sea containers. Of interest to the IFQRG membership is the draft annex to ISPM 39 on systems approaches which has undergone its second round of country consultation and will be submitted for adoption at the next CPM in March 2024. If anyone is not subscribing to the IPPC newsletter they may do this for regular updated: https://www.ippc.int/es/news/subscribe-to-the-ippc-newsletter/

Mr. Nersisyan recognized the importance of IFQRG and the role it plays in filling the gaps in expertise in the IPPC and welcomed opportunities for more collaboration with IPPC.

5.2 European and Mediterranean Plant Protection Organization (EPPO): an update on activities in the field of forest quarantine

Dmitrii Musolin (European and Mediterranean Plant Protection Organization, EPPO)

Work of EPPO was introduced with a focus on the activities in the field of the forest quarantine. Updates were provided on the EPPO Global Database, Alert List, A1 and A2 Lists of species recommended by EPPO to member countries for regulation as quarantine pests and the recently established Network of experts working on surveillance, monitoring, and control of Agrilus planipennis (Emerald ash borer).

- Pests alerts have been released for the EPPO Region:
    - Monterrey Pine Engraver (*Pseudips mexicanus*)
    - Australian tortoise beetle (*Trachymela sloanei)*
    - Vascular streak dieback (*Oncobasidium theobromae*)
    - *Cryphonectria carpinicola*
    - Myrtle rust (*Austropuccinia psidii*)
- Added to A2 list (regulated pests)
    - Apple buprestid (*Agrilus mali*)
    - Pine tortoise scale (*Toumeyella parvicorni)*
- Advancing network of experts on emerald ash borer
- Other EPPO workshops and meetings
- Updating standard on heat treatment of wood to control insects and wood-born nematodes
- Working on a guidance document on the movement of wood chips

During the recap discussion an IFQRG member asked about the suggested pathway for *P. mexicanus* being WPM. Mr. Musolin later noted that according to the PRA team there was evidence of *P.m. in* WPM (treatment was unknown). However the introduction of *P. mexicanus* is not confirmed to be via WPM. The same question was posed for myrtle rust. It was noted that this might have entered as a possible contaminant on wood. The group discussed the need for PRA to describe the pathway and getting off the pathway. This pest is of concern in particular for the Mediterranean region.

5.3 Technical panel on phytosanitary treatments (TPPT) update

Artur Shamilov (Standards Setting Officer, FAO) and Colleen Stirling (Standard Setting Unit Specialist, FAO)

The Technical Panel on Phytosanitary Treatments (TPPT) evaluates data submissions from National and Regional Plant Protection Organizations and reviews, revises and develops phytosanitary treatments. This group also provides guidance to the Standards Committee regarding specific phytosanitary treatment issues. The TPPT evaluates treatment submissions against requirements in the International Standard for Phytosanitary Measures ISPM 28 – Phytosanitary treatments for regulated pests. An overview of the submission process, need for phytosanitary treatments and the current status of PTs were provided.

Mr. Shamilov noted that three members of IFQRG were also on the TPPT. He noted that there is a new wood treatment submission from Portugal for the steam heat treatment of wood chips to address *Bursaphelenchus xylophilus* which has been recommended by the TPPT to be added to the

TPPT work program. The Standards Committee (SC) will meet in November 2024 and take this under consideration. It was also noted that the ISPM 15 criteria draft annex developed by the former Technical Panel on Forest Quarantine (TPFQ) was reviewed by the TPPT in June - Oct 2024 for inclusion in the IPPC Procedures Manual. While the ISPM criteria will not be annexed to the ISPM 15 standard it will be in the IPPC Procedures Manual which is considered strongly recommended to be followed when developing treatments. This guide is updated regularly and referred to for the development of PTs and DPs. The SC will review at the SC meeting in May 2025. The SC will recommend at the CPM in March 2025 that this topic be removed from the SC Work Program. The steward for this topic is retiring in April.

A member of IFQRG asked how NPPOs or contracting parties (CPs) can support the SC in this decision. It was recommended that IFQRG members speak with their respective SC members. In addition,it was recommended that IFQRG members review and discuss the draft ISPM 15 treatment criteria this week and provide support. IFQRG provides a CPM report each year. There was more discussion on ISPM 28 and ISPM 15 and how new treatments for ISPM 15 might be annexed. This has not been decided by the SC yet.

5.4 Asia and Pacific Plant Protection Commission/Pacific Plant Protection Organization, APPPC/ PPPO report

Mike Ormsby (Ministry of Primary Industries, NZ)

The Asia and Pacific Plant Protection Commission (APPPC) has 24 country members that account for around 35% of world raw wood import trade and 19% of world raw wood export trade. The APPPC recently adopted two commodity standards for whole milled white rice (*Oryza sativa*) and fresh longan fruit (*Dimocarpus longan*). Forestry-related work has primarily focused on import requirements to mitigate the risks of the South American Leaf Blight (SALB) of Hevea rubber. The Pacific Plant Protection Organisation (PPPO) has 26 country members mainly comprised of south Pacific island countries but also including New Zealand, Australia, France and the USA. This region accounts for around 9.2% of world raw wood import trade and 19.5% of world raw wood export trade mainly out of the USA, New Zealand and Australia. Very little work has focused on forestry pests unless you include coconut palms and the Coconut Rhinoceros Beetle (*Oryctes rhinoceros*).

5.5 North American Plant Protection Organization (NAPPO) forestry projects report

Meghan Noseworthy (Canadian Forest Service, CFS), Ron Mack (United States Department of Agriculture, USDA APHIS), Scott Geffros (CWPA), Brad Gething (NWPA), Adnan Uzunovic (Canada Wood)

Meghan Noseworthy reported on NAPPO projects related to forestry. (1) The NAPPO Forest Quarantine Research Group was initiated in 2022 to review and address phytosanitary issues related to wood commodity trade. The group meets 4 times a year and identifies solutions to issues including recognition of potential NAPPO projects. (2) The categorization of risk associated with wood packaging material (WPM) was initiated in 2022 and the group have been working to identify WPM categories, describe associated risk and collect interception data to analyze differences between

different categories of WPM. (3) The NAPPO heat treatment water bath study was approved in August 2024 and has not commenced. This group will build heat treatment baths in different locations in North America to test forest product pests from different regions. A standard operating procedure to build, treat, collect and analyze data will be developed and research undertaken. (4) The NAPPO Alternatives to methyl bromide (MB) group is in its final year and will prepare recommendations for alternatives based on the EG's work.

The objective of the alternatives to MB group is to develop a NAPPO Discussion Document to share information regarding alternative treatments for MB, with a possible goal of creating an agreed position aligned to international standards. Alternatives must be efficacious, economically feasible and environmentally friendly. The group has identified select fumigants including EDN with pros and cons as well as non-fumigant alternatives to MB including heat treatment, MB recapture and systems approaches. The NAPPO EG noted at the NAPPO Annual Meeting in October, 2024 that a case-by-case review will be needed to replace current agreements and this will take time. A NAPPO Discussion Document will summarize alternatives available, will not recommend pest-commodity specific alternatives, will note that each nation or contracting party will have to determine their acceptable level of risk. The Montreal Protocol on Substances that Deplete the Ozone Layer Meeting of the Parties (MOP 36) met October 28 to November 1 in Bangkok, Thailand but there is no report yet. It was also noted that if MB is listed under the Rotterdam Convention MB use will be more restricted if listed as a hazardous substance.

A member asked when the NAPPO Alternatives to MB Discussion Document will be published. The group is writing the document currently as the project is scheduled to finish in 2024. It will be available on the NAPPO website when complete.

During the recap discussion an IFQRG member asked if NAPPO has a pest early warning system like the EPPO A1 and A2 lists. NAPPO has a Pest Alert System (PAS) which includes emerging pest alerts and official pest reports. To subscribe https://www.pestalerts.org/nappo/

5.6 The Global Alliance for Plant Health Quint Collaboration projects overview/ Methyl bromide alternatives working group

Ron Mack (USDA APHIS), Mike Ormsby (MPI), Meghan Noseworthy (CFS), Mireille Marcotte (CFIA)

The Global Alliance for Plant Health (GAPH – formerly Plant Health Quadrilaterals – PH Quads) Quints is a forum of National Plant Protection Organizations (NPPOs) – Australia, Canada, New Zealand, the United States and the United Kingdom. Under this collaboration research projects and working groups have been formed to address biosecurity issues, share information, find solutions to phytosanitary issues, and develop and share new tools and technologies for plant protection. An overview of the projects under this collaboration were provided with a special focus on the Methyl Bromide Alternatives Working Group (MBAWG).

The Montreal Protocol on Substances that Deplete the Ozone Layer (MP) require a phase-out of methyl bromide (MB) for non-quarantine and pre-shipment uses except for specific critical exemptions by 2005 in developed countries and 2015 for developing countries. This phase out has generally been very successful. Quarantine and pre-shipment (QPS) use is currently the predominant use of MB. In 2008 the Commission on Phytosanitary Measures (CPM) of the International Plant

Protection Convention (IPPC) made a recommendation to replace or reduce the use of MB as a phytosanitary measure. The Methyl Bromide Alternatives Working Group (MBAWG) was established by the Plant Health Quints Collaboration Working Group (PHQCWG) to share data and information for scientific collaboration including research gaps and synergies, priority alternatives to MB, facilitate sharing information, and collect usage data. The project scope and findings were presented, and feedback requested.

It was noted that the Quints group invited the NAPPO Alternatives to Methyl Bromide Expert Group Chair to a meeting and to ensure no overlap of efforts. Ron noted the focus of the Quints group has been on heat treatment and ethane dinitrile (EDN) fumigation in the last years, however systems approaches have recently been added as optional alternatives to MB. It was also noted by an IFQRG member that while the focus of the group in the past has been on wood, they are looking at all uses of MB currently and systems approaches should be considered.

6. Research to support the development of international standards for phytosanitary measures (ISPMs) for plant protection

6.2 Report on the ISPM 15 workshop with the EU-member states in Germany 2023

Thomas Schröeder (Federal Ministry of Food and Agriculture (BMEL), Division 714 – Plant Health and Phytosanitary Affairs in Export, Bonn, Germany)

In October 24-25, 2023, the EU member states met in Germany to discuss issues in implementing ISPM 15 to figure out whether and where harmonisation may be necessary or whether further guidance is needed. The occasion was the 20th anniversary of the publication of ISPM 15 and the publication of the guidance document by the IPPC Secretariat in 2023. Following reports on the history of the development of ISPM 15 as well as implementation in some EU-member states the group discussed the following topics: registration of companies, supervision of registered operators, treatments including verification, import of ISPM 15 treated sawn wood for production of WPM, import inspection of WPM in use, marking, and reuse/repair/ and remanufacture. Working groups were formed to discuss 1. importing ISPM 15 treated sawn wood for production of WPM and the necessary documentation and proof and 2. needs for harmonisation between member states, amendment of ISPM 15 or guidance documents and research.

A number of agreements have been established and the main results and conclusions were presented, e.g.: use of the registration number, whom to register, inspection of HT-providing operators, marking before treatment, wood falling under ISPM 15 (glued-laminated timber) or which kind of pests are a reason for non-compliance (dry wood insects).

Suggested knowledge gaps were also presented, including a tool to verify heat treatment compliance during inspection, documentation on guidance related to dielectric heating, and clarity on the current understanding of how drywood pests infest WPM.

In general dry wood pests are not part of the ISPM 15 scope.

Action Item: Chris Howard informed the group that the new ISPM 15 Guidance Document has information on drywood pests and will follow-up with information. He will report back to the group regarding its accuracy and adequacy.

The IPPC Secretariat informed an IFQRG member that the guidance document is being translated into Spanish and French. There is a need for translation into Arabic, Russian and Chinese. Please contact the Implementation and Capacity Committee if you can help.

ISPM 15 Guidelines: https://openknowledge.fao.org/items/8e112753-c6f3-468d-a5b3-9657bdb949fb

Action Item: The group discussed developing a white paper describing drywood pests associated with wood post treatment pending advice from Chris Howard.

Action Item: Ron Mack offered to provide information on dielectric heating guidance.

Additional comments from the beginning of Day 2:

- Conversation on HT verification
    - In the Kiln
        - Using more probes provides better identification of cold spots in the kiln
        - Yearly mapping of cold spots. It can change location slightly (around 1 meter)
        - Can use inexpensive, single-use “pop up” sensors (PODs) to insert into the wood that identify when a specific temperature is reached. The phytosanitary world would benefit from a more advanced version that would indicate when the 30 minute threshold was achieved (e.g. melting).
        - There doesn’t seem to be a “marker” that exists to identify in a unit of WPM has been treated according to ISPM 15.
            - Assurance for pallet users as well as port inspectors

Kiln technology and the use of core probes as well as schedules were discussed. Some HT schedules for wood were created to provide basic guidance on simple treatment and result in over treatment. Using core probes and developing subsequent treatment schedules has the potential to result in a 30-40% reduction in run time in Canada. It is difficult to build a generic schedule for core probes because of variability in material, loading, and heating apparatus.

6.3 The continued downtrodden reputation of ISPM 15

Christopher Howard (Biosecurity Plant and Science Services Division, Department of Agriculture, Fisheries and Forestry DAFF, Canberra, Australia)

One of the most successful and globally harmonising International Standards for Phytosanitary Measures (ISPM) is ISPM 15 - Regulation of wood packaging material in international trade (ISPM 15). Despite its clear scope and recently published implementation guidance material, the effectiveness of ISPM 15 remains in doubt nearly 2 decades since its adoption. Unfortunately, anecdotal opinions and published primary literature exists that maintain that wood packaging continues to be the main pathway for the global spread of forest pests, which may insinuate that ISPM 15 is ineffective. It is possible that a communication issue exists; many academic-based scientists concerned with the spread of forest pests may simply not be aware of the limited scope of ISPM 15 nor the operational realities of implementing a global standard. This discussion highlighted this issue and promoted discussion of possible collaborative solutions to support better informed debate on the effectiveness of ISPM 15.

The perceived reasons for the negative attitude toward ISPM 15 effectiveness:

- Misunderstanding of the scope of ISPM 15 and concept of Appropriate Level of Protection (ALOP)
- Interception data includes contaminating pests or non-compliant WPM
- Interception data includes WPM that was never certified ISPM 15 compliant

There was also discussion on what can be done to improve the reputation of ISPM 15:

- Collect relevant information
- Publication to put risk in proper context

Action Item: Chris and other IFQRG members will continue to work to educate forest science leaders and help change this perception through discussion on appropriate level of protection (ALOP), Allee effects consideration, differential level of risk, actual infestation rate, volume of WPM trade compared to the interception rate, detection versus incursion, an understanding of the scope of ISPMs and comparison to risk associated with plants for planting and harvested foliage commodities.

Follow up questions:

Q: What is the acceptable level of protection? A: The level of protection is when a country agreed to use an ISPM when it was adopted. An ISPM provides a level or protection that countries have agreed is practically sufficient for them to achieve an acceptable level of risk.

It was noted by another IFQRG member that based on an investigation carried out from 2013-2015 in the EU, the interception data is highly dependent on the efficacy of inspection and interception is often very low (e.g. 0.1%). Efficacy of various contracting parties is not equal. For example, for similar consignments, the interception rate in France and Austria was 7%, whereas in other countries it was as low as zero (Eyre et al. 2018).

Day 2

Recap of Day 1

Recap of Day 1 find comments above associated with the topic.

Eric Allen

6.5 Global movement of wood

Michael Ormsby (Ministry of Primary Industries, NZ)

This presentation looked at the volumes of raw wood traded internationally in July 2022 to June 2023 based on custom declaration codes. There are a number of caveats to this data given the potential avoidance of customs records where it can be avoided, unit inconsistencies, and the exclusion of any country that does not belong to the International Customs Union. Total world trade data on raw wood (timber, logs, and chips of soft and hardwoods) indicates four countries lead in recorded export volumes (Chile, New Zealand, Canada and South Africa) and China leads the world in import volumes. Breaking this down further, New Zealand primarily exports softwood timber and logs. Europe dominates the international trade in hardwood species. This was a general overview and it was recognized there were gaps in the data.

It was noted that the data for wood chips from Canada seemed high and needed to be verified, also India was missing from many analyses. It was noted that HS codes were used and there were gaps in the data.

6.6 ISPM 28 and ISPM 15 treatment submission requirements

Mike Ormsby (Ministry of Primary Industries, NZ)

The Technical Panel on Phytosanitary Treatments evaluates data submissions from National Plant Protection Organizations (NPPOs) and Regional Plant Protection Organizations (RPPOS) and reviews, revises and develops phytosanitary treatments. Submissions are evaluated against the requirements in ISPM 28 (Phytosanitary treatments for regulated pests) under the guidance of the Standards Committee (SC) as mandated by the Commission on Phytosanitary Measures (CPM). The agreed procedure for the evaluation of phytosanitary treatments for inclusion in an International Standard for Phytosanitary Measures (ISPM) are outlined in the IPPC Procedure Manual for Standard Setting. Data requirements and the evaluation process for submissions to ISPM 28 were reviewed and discussed with examples.

- When developing treatments for ISPM 15, the following are criteria that need to be considered:
    - Associated pests – screen for tolerance and use most tolerant
        - Presented a table that outlines an approach/methodology to best determine a pest list to evaluate a treatment
    - Pest life stages – screen for tolerance and use most tolerant
    - Wood species and other physical characteristics of the wood
    - Environmental conditions
- Validation of the effective treatment schedule through replication (dose/response curve as an example) This step is not essential but can aid in identifying the best treatment schedule in the final step.
- Validation under operational conditions. Minimum number of required pests depends on the pest type (as determined by Ormsby 2022)
- Other considerations were presented including commentary on treatment numbers, how to handle natural death of controls, proper confidence levels if using estimations rather than actual counting, and population fitness.
- There was a discussion on how this approach would be utilized for fungi.

The steps outlined in the criteria for ISPM 15 treatments were created with the understanding that it can be costly to develop treatments. The outlined criteria in four steps provides treatment developers with what they need to know for a successful submission.

Data may be provided from existing literature or laboratory research. It's recommended to only do additional research where gaps occur.

It was recommended that researchers consult with TPPT members or other treatment researcher experts before embarking on research to ensure the design is solid.

For ISPM 15 all wood species should be included in screening. If submitting a treatment for one wood only species the submission should go for inclusion under ISPM 28.

In **Step one**: to find the most tolerant stage it is recommended to treat 5 individuals per sample (species/ lifestage). A member suggested that this be edited to '5 per family' to find the most tolerant species in a family.

Step two: physical parameters are considered such as temperature, moisture content, dimensions of the wood, anatomy and density of wood, presence or absence of bark, level of treatment.

Note: It should be demonstrated that treatment is capable of killing pests throughout the profile of the wood. Need to show how the fumigant moves through the wood. Cannot be pest specific, must address all pests anywhere.

Step three: Validation of treatment. This steps ensures there is no over treatment. The sample of 60 for this experiment is required for sufficient confidence (e.g., see ISPM 31 for 95% confidence).

Step four: Confirmatory trials under operational conditions

Questions:

Q: How do you determine death? A: emergence is used in fruit flies and nematodes incubate and multiply quickly.

Q: Do you use fungi from different origins? A: Fungi of at least 3 isolates to run an experiment.

Other important considerations for data:

A. Treatment outcome - is it achieved naturally? Use Abbott's formula (1925) to account for natural death in controls
B. If estimates rather than direct counts are made, adjust to achieve a 95% level of confidence using a one-tailed t-test. You will likely need to test larger numbers using estimates
C. Fitness - if the death rate is too high and the population is considered not fit the population may be less tolerant to the treatment. In the past if the death rate was higher than 10% the study was rejected. This view has changed. Some insect life history includes a very high fecundity because they also have a high natural mortality rate. What matters is the population will be viable (increase every generation) under the experimental conditions.

Questions:

Q: For all treatment verification work it doesn't seem to be practical to get high infestation rates to test. A: Ideally collaborate internationally to get pests where outbreaks occur. Most ISPM treatments are single species. WPM ISPM 15 treatments are for a commodity and need to have multiple species and will require global collaboration. Alternatively use a closely related surrogate, e.g. if you cannot get *Anoplophora glabripennis* (ALB) use a *Monochamus* spp.

6.4 Risk categorization of wood packaging materials

Meghan Noseworthy (CFS), Eric Allen, Ron Mack (USDA-APHIS)

Since the implementation of ISPM 15, the incidence of pests moving on the wood packaging material (WPM) pathway has been greatly reduced. Despite the success of ISPM 15 the continued interception of pests associated with WPM is considered to be an unacceptable risk by many stakeholders. What is not clear is whether the risk is consistent across the different types of wood packaging (pallets, crates, packaging cases, cable drums, dunnage etc.). For example, North American

countries recognize dunnage as a high-risk category of WPM which is often identified as non-compliant (due to pest detection, lack of ISPM 15 mark, or unknown status). New pest risk analyses have led to dunnage-specific programs to dispose of and treat non-compliant dunnage. In 2023 the North American Plant Protection (NAPPO) created a working group to research and develop a technical document to address the challenges associated with different categories of WPM in order to share best practices implemented by different WPM sectors with an aim to improve compliance with ISPM 15 guidelines.

Two key findings resulted from preliminary work:

- Harmonization of terminology was a very important first step to ensure clarity
- Using relevant interception data to make informed conclusions has proven difficult. An unbiased data set does not exist.

The next step toward building the document is the creation of a spreadsheet that outlines key aspects of wood packaging and how they might affect compliance.

6.7 Treatment Submission Requirements (Continued)

Mike Ormsby presented ISPM 28 treatment submission creation and evaluation. There was an ensuing discussion on procedures for interacting with the TPPT.

There was also a discussion on the potential difference between a submission for ISPM 28 and ISPM 15, and a review of the IPPC Procedure Manual was provided. It was pointed out that the importance and use of controls could be strengthened in this document. An update to the Procedure Manual is being drafted.

Questions:

Q: Will the submission form for ISPM 15 be the same as ISPM 28? A: It will be the same submission form but the information required for ISPM 15 will be more comprehensive as it will include more wood types and target species.

Q: What is the time frame for a submission to ISPM 28 assessment. Does the TPPT meet out of session? A: The TPPT meet in-person once-a-year and virtually throughout the year. When a submission is received, a lead from the panel is designated. The lead fills in a form from the submission form and they make recommendations to the TPPT on strengths and weaknesses of a submission. If more information is needed from the submitter this is requested through the NPPO contact point for the submission. Once a PT is drafted it will go out for country consultation and if there are major issues it may go for a second round of country consultation. It can take 3-4 years to become adopted. Conflicts of interest are managed, for example, by ensuring the TPPT lead for a submission is not from the submitting country or has not been involved in drafting the submission or doing the research. The next face-to-face meeting of the TPPT is in June 2025.

Q: Can adopted treatments be challenged? A: New information and data come forward often and standards are updated. If a country misses both rounds of country consultation on a draft PT or DP they can challenge adoption at CPM assuming they can identify a significant problem with the submission. Any country can provide justification to their trading partner for why they require something different than a recommended PT or DP.

Q: What level of information is available on adopted PTs? A: There is a TPPT report openly available describing the process for development of each PT. Responses to country consultation comments are publicly available as well. The PT is also referenced with publications and associated data used to calculate the efficacy and treatment specifications.

A review of the IPPC Procedures Manual was given and comparison between an ISPM 28 and ISPM 15 SF treatment made. The main differences were that ISPM 28 had 4 pests, efficacy data and references, whereas the ISPM 15 schedule did not list the treated pests or efficacy data, but did contain much more information on how to implement the treatment.

The recommendation to have more information on controls in the IPPC Manual was noted. The Treatment Research Guidelines were recommended for review on this subject.

6.8 Alternatives to Methyl Bromide for Wood Products

Adnan Uzunovic, Canada Wood

Adnan provided a summary of methyl bromide (MB) fumigation as a phytosanitary treatment. MB depletes the ozone layer. Attempts to phase out or eliminate MB use have been declared by many governments. It has been difficult to find a good alternative in the past.

Phosphine and SF have traditionally been used and explored as key replacements for MB, being familiar and registered worldwide, however, they have drawbacks. In the recent decades, EDN has been shown to be a broad spectrum fumigant with no known environmental issues. It has potential for fumigating wood products. Administrative issues include complex registration and efficacy recognition under existing guidelines at an international level (ISPM 28, ISPM 15).

Recent work to develop a submission to ISPM 28 by an NPPO against three wood beetles shows promise, although addressing other administrative hurdles still remain.

Discussion regarding data sharing and treatment harmonization occurred. There was recognition that while the research to support this potential fumigant has been lengthy, much has been learned for future treatment development and submission.

Virtual Session – Day 2, Tuesday November 5, 2024 15:00 – 17:00 CET

7. Launch: Guide to implementation of phytosanitary standards in forestry – Second Edition

Shiroma Sathyapala & Natalia Cano (FAO Forestry), Eric Allen (IFQRG SSC), Thomas Schröeder (Federal Ministry of Food and Agriculture BMEL), Meghan K. Noseworthy (Canadian Forest Service, Pacific Forestry Centre, Natural Resources Canada)

Healthy forests and trees are essential for all aspects of a healthy planet. Yet, increasing global movement of people and goods has accelerated the spread of pests, leading to severe environmental and economic damage. The second edition of the Guide to Implementation of Phytosanitary Standards in Forestry" builds on the foundation of the first volume, launched in 2011, and integrates new International Standards for Phytosanitary Measures (ISPMs). The original, and this version are essential tools for the implementation of phytosanitary measures in forestry, providing clear and accessible information to safeguard forests and trees from pests. During this session, we will hear insights on the impact of the first volume and discuss future efforts for strengthening forest health protection.

- Dr. Ewald Rametsteiner, Deputy Director Forestry Department, Food and Agriculture Organization of the United Nations gave an introduction to the guide and thanked the IFQRG members current and past for their commitment to healthy forests and their support and contributions.
- Eric Allen gave a historical perspective on the guide and highlighted key aspects of the guide including:
    - reduction of of the movement of pests
    - making ISPMs more accessible to the forest sector
    - initiating a common understanding of phytosanitary concepts
- Eric noted the 2021-2024 revision
    - Responded to input learned from stakeholders
    - Incorporated new ISPMs
    - Added new advancements in forestry practices
    - Revised terminology
- Thomas Schroeder discussed the importance of the updated guide.
- An IFQRG member gave remarks on the uniqueness of the guide and its contribution to the phytosanitary world.

8. Molecular Tools

Several promising molecular tools for the detection and identification of pests on forest and wood products were discussed in this session including DNA, RNA, and protein detection methods. A major theme for this session was the need for the development of standards, best practices guidelines, and approved protocols.

8.1 The IFQRG Molecular Tools Working Group: Working towards recommendations for molecular tools for identification of pests on forest products in trade

Angela Dale (Natural Resources Canada, Canadian Forest Service)

Molecular diagnostics is a rapidly advancing field, which is steadily becoming more accessible and affordable. Many plant pest diagnostic laboratories routinely use molecular tools to identify pests and diseases that are difficult to discern based on morphology alone. As the field advances, many questions remain on how these tools could affect trade, and how or when to apply them to pests associated with wood products. In 2023, a working group within the International Forest Quarantine Research Group was formed to start to look at some of these questions, opportunities, and challenges as they pertain to the use of molecular tools in the trade of wood products. As common themes start to emerge from discussions, the group will attempt to provide some recommendations and potential action items to the larger IFQRG community. This presentation will provide an update on the activities of the group to date.

Angela Dale presented a summary of the new IFQRG "Molecular Tools Working Group" and the identified and prioritised needs that have been identified by the group. Two major hurdles were identified: data sharing and having adequate relevant, accessible nucleic acid sequence databases. A major goal of the WG is to produce a guidance document that recommends: reporting requirements; a list of acceptable tools (with a focus on tools and applications that are currently ready for use); laboratory and personnel training requirements; and what post-detection analyses should be done. Angie proposed that this guidance document could serve as a seed document for the generation IPPC-based reference material.

Five main themes:

- Reporting requirements and metadata
- Acceptable tools
- Requirements for facilities and proficiency testing
- Post detection
- Data accessibility and sharing

The group is looking for feedback on how to prioritize their efforts.

Discussion:

There was discussion on what role a guidance document would play for the IPPC related to molecular tools. There is an opportunity to utilize RNA but it has yet to be discussed by the group.

Questions:

Q: Data sharing and accessibility are two key issues identified. A: Data sharing metadata should be open.

Action Item: Dmitrii will share the EPPO workshop and conference on diagnostic protocols happening in 2026 Austria.

Comment from the IPPC - IFQRG is an official partner of the IPPC and the IPPC works with other similar partners for the benefit of the IPPC.

Recap - Feedback from the IFQRG group meeting included a recommendation to narrow the scope of the IFQRG Molecular Tools working group to focus on guidance to NPPOs on how to assess and respond to the use of molecular tools in trade.

8.2 The iTrackDNA Project: Enhancing Forestry Industry Sustainability with Environmental DNA

Caren C. Helbing[1], Gwylim Blackburn[2], Isabel Leal[2], Stacey Kus[3], Vanessa C. Thompson[1], Hajeong Lee[1], Esme John[2], Adnan Uzunovic[4], and Jacob J. Imbery[1]

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[4] Canada Wood Group, Vancouver, British Columbia, Canada

Ecosystem biodiversity, environmental impact, and risk assessments are being transformed through the application of new tools that measure environmental DNA (eDNA) - genetic material shed from organisms into their environment. The large scale applied research project, iTrackDNA (itrackdna.ca), aims to fill critical knowledge gaps essential for confident uptake of this revolutionary technology by promoting robust assay and study design, creating essential genomics resources, supporting national and international standards creation, and developing training and proficiency testing frameworks. This presentation will show how iTrackDNA is raising end user capacity and proficiency in the application of eDNA methods and explore the project's impact on the forestry sector. The project showcased how eDNA can improve species-at-risk monitoring, invasive species management, and enhance decision-making processes.

A variety of examples were presented to show how eDNA has been used to show the presence of an organism in an area.

Caren Helbing presented the potential use and advances made through the Canadian iTrackDNA project in the application of eDNA and eRNA - species detection methods to detect genetic material that is sloughed off into the environment. The iTrackDNA project has broad support in Canada, with buy-in from 46+ government, First Nations, industry, and NGO stakeholder base. Focus has been to develop robust assay and study design, creation of genomics resources, supporting the creation of national standards, and development of training and proficiency testing frameworks. A highlight is the creation of two national standards by the Canadian Standards Association for eDNA: the first on minimum reporting requirements and terminology (Gagné et al., 2021) and the second on performance criteria for the analyses of eDNA by targeted quantitative polymerase chain reaction (Abbott et al., 2023). A third standard is being developed on field methods and study design. Environmental DNA (eDNA) and associated eRNA methods are promising tools for forest/wood product surveillance, and determining effectiveness of phytosanitary measures use in trade.

8.3 Application of Biomolecular Approaches for Tracking the Efficacy of Phytosanitation Measures Against the Pinewood Nematode in Wood Products

Vanessa C. Thompson[1], Hajeong Lee[1], Jacob J. Imbery[1], Stacey Kus[2], Esme John[3], Holly Williams[3], Adnan Uzunovic[4], Luís Fonseca[5], Joana Cardoso[5], Gwylim Blackburn[3], Isabel Leal[3], and Caren C. Helbing[1]

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The pinewood nematode, *Bursaphelenchus xylophilus*, poses a significant threat to the global forestry industry. Current methods for determining the effectiveness of phytosanitary measures are laborious and unable to distinguish between pinewood nematode and other innocuous nematodes at all life stages. Innovative detection methods are needed to mitigate pinewood nematode impact and increase confidence in the effectiveness of phytosanitary measures. This presentation will introduce how biomolecules in the form of DNA and RNA can address industry challenges in detecting pinewood nematodes at all life stages. We outline a series of rigorous experiments needed to determine limit of detection, specificity, and ability to distinguish between live and dead nematodes to effectively track the reliability of phytosanitary measures.

A summary of how eDNA/eRNA may be applied to pinewood nematode was given. Samples being tested in The Humble Water Bath and kiln are being evaluated to detect RNA presence compared to DNA.

Vanessa Thompson presented a use-case application from the iTrackDNA project- detecting live/dead pinewood nematode (*Bursaphelenchus xylophilus*; Bx) in the context of tracking the efficacy of phytosanitation measures in wood products.. Vanessa showed how Bx eDNA is used to infer presence/absence and eRNA is used to detect Bx viability. RNA can be short lived and detection of Bx eRNA could indicate that the organism is still alive and actively producing RNA after phytosanitary treatment has been applied. For application in determining heat treatment phytosanitary measure efficacy (56^{o}C @ 30 min), it is important to identify RNA that is expressed at consistent and high levels at non-kill temperatures at key life stages (egg, juvenile (JIII), and adult) but substantially decreased once the desired temperature has been reached. This approach ensures that the molecular readout of viability is relevant to all stages found in wood. RNA-Seq data collected from each of the three developmental stages at several temperatures between room temperature to the kill temperature were used to identify RNA that satisfies the above criteria.

8.4 A Case Study in Developing Molecular Assays for Detecting Live and Dead Pinewood Nematodes in Wood Products

Hajeong Lee[1], Vanessa C. Thompson[1], Jacob J. Imbery[1], Stacey Kus[2], Esme John[3], Holly Williams[3], Adnan Uzunovic[4], Luís Fonseca[5], Joana Cardoso[5], Gwylim Blackburn[3], Isabel Leal[3], and Caren C. Helbing[1]

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Creating effective methods for detecting live and dead *Bursaphelenchus xylophilus* (pinewood nematode) in wood products involves several technical and methodological challenges. This presentation provides a “behind-the-scenes” look into the process of developing environmental DNA and RNA-based assays to accomplish this. We provide insights into the complexities of assay development and the innovative approaches used to overcome obstacles. We highlight some challenges faced and solutions implemented to ensure assay accuracy and reliability. Successful implementation of these assays will improve confidence in determining the efficacy of phytosanitary measures against pinewood nematode infestations of wood products.

Hajeong Lee (University of Victoria, Canada) provided an overview on the challenges with designing Bx detection assays. Challenges include: including lack of genomic information for *Bursaphelenchus* species; the high similarity of genomic information between Bx and other *Bursaphelenchus* species; and genetic variation between Bx strains. Hajeong presented candidate assays that were developed to specifically detect Bx eDNA and eRNA and that were incorporated into a four-part “BxCheck” assay that tests for specific Bx nucleic acids. This assay establishes sample integrity using IntegritE-DNA® and IntegritE-RNA™ assays that test for endogenous chloroplast DNA and RNA, respectively (Hobbs et al., 2019; Veldhoen et al., 2016). Indication of successful phytosanitary measures on wood products include positive detections of Bx eDNA and passed integrity checks for DNA and RNA and a failed detection of Bx eRNA. Validation experiments are being conducted using a rigorous established pipeline (Langlois et al., 2021) as well as testing on Bx-infected wood samples and identifying a suitable workflow for sample collection that is best for field applications and uptake acceptance.

8.5 Genomics at our service: development of point-of-care diagnostic assays for forest pathogens

Nicolas Feau, (Pacific Forestry Centre, Natural Resources Canada, Victoria, British Columbia, Canada)

Globalization facilitates the spread and establishment of alien invasive forest pathogens to new environments. Climate change exacerbates this issue by increasing the geographic range of pathogens beyond their current distribution. Early detection and surveillance programs conducted with proper pest and pathogen diagnostic tools can have a strong impact on preventing or mitigating

future ecosystem impacts. Genomics has become an integral part of this process by revolutionizing the way molecular diagnostics assays are developed and implemented. I will illustrate this point with a few examples of how next-generation sequencing and different types of "omics" data can provide the molecular blueprint for the development of portable point-of-care diagnostic assays for forest pathogens. Despite their affordability, the adoption of genomics-based diagnostic assays by stakeholders still constitutes a significant bottleneck. I will discuss the strategies that we have developed to increase the permeability of our diagnostic assays to stakeholders and reduce the risk of non-adoption.

Point-of-care diagnostic assays for forest pathogens carried by conifer seeds including Nanopore sequencing and antibody/antigen-based detection were presented. These approaches are easy and fast, but still require some development. A key feature for effective translation and adoption of these tests is the active efforts to obtain feedback from stakeholders through active community consultation and training videos. These tools are easy to use and becoming more accessible. The tools have been used to assess conifer seeds for forest invasive species which are difficult to detect in asymptomatic sees. Sooty bark disease *Crytpostroma corticale* recently found on Vancouver Island was used to develop tests. Currently seed tests miss low level presence. Researchers are looking to work with larger seed lots.

8.6 IPPC diagnostic protocols and diagnostics for pests of forest products

Adriana Gonçalves Moreira (Standards Setting Officer, IPPC, Rome)

A summary of the goals of IPPC and role in safeguarding plant health while facilitating international trade, along with a high-level overview of standards setting was provided.

- ISPMs take approximately 6 years to develop
- Diagnostic protocols take approximately 3-4 years to develop
    - DPs provide information for diagnosis of pest detection and identification
    - There are 5 DPs relevant to forestry

An important feature of the IPPC efforts is ensuring availability to developing and developed countries and to harmonize phytosanitary measures.

As molecular methods are increasingly incorporated into the detection and diagnostic toolbox, a key challenge is how to determine the threshold for triggering management and regulatory decisions.

END of Virtual Session – Day 2, Tuesday November 5, 2024 15:00 – 17:00 CET

8.7 Molecular Tools Recap

Caren C. Helbing

A summary was given on how eDNA/eRNA tools are used and captured below the abstract for each presentation topic above.

Questions:

Q: What volume of sample is needed from a unit of WPM? A: This is still unknown and is being investigated. The most important thing currently is the quality of the sample. This may be problematic if the pest is clustered - pest presence may be missed. Thomas Schroeder has published some guidance on sampling that may address this problem.

Q: How to check for thermotolerance? A: They used JIII which is considered the most desiccant resistant life stage; however other life stages could be relevant.

Q: Would this new tool potentially negatively affect trade by changing how pests are identified in products when they hadn't been before? A: A general discussion followed. Current focus is on developing consistent and reliable molecular tools. However, until the regulatory community has the understanding of how to interpret the data obtained through these molecular tools, a harmonized approach will be difficult to achieve.

Action Item: Molecular tools group could approach the IPPC Secretariate to determine what forum this topic could be raised in (e.g., TPDP).

9. Phytosanitary challenges and treatments

9.1 IPPC Guide on Climate Change and Phytosanitary Issues

Dominic Eyre (Department for Environment, Food and Rural Affairs DEFRA, UK)

The guide has been developed from the Focus Group on Climate Change and Phytosanitary Issues

Sections:

- Introduction
    - Overview of climate change and projections
- Climate change impacts on plants and plant pests
    - Changes in pest distribution
    - Changes in pest phenology
    - Effects on agriculture
    - Effects on forest and the environment
- Assessment of climate change impacts on plant health
    - Climate and pest forecast modeling
    - Horizon scanning
    - Pest risk analysis
    - Pest reporting
    - Pest risk pathways
- Management of climate change impacts on plant health

    - Pest surveillance and monitoring
    - Response plans
    - International cooperation and capacity building
    - Communication
- Case studies
    - Adding climate change into pest risk assessments
    - Pest forecasts
    - Raising awareness
    - Fostering collaboration

Designed to be a resource to help countries handle the effects of climate change.

Experimental sites were presented where the impacts of climate change are being studied.

https://www.ippc.int/en/news/out-now-new-ippc-publication-on-climate-change-impact-on-pests/

Action Item: If anyone from IFQRG has ideas on what activities might be included in the future work of the focus group, they can get in touch with Dominic.

9.2 Forest pests heat treatment research - specific lethal doses for wood borers and fungal pathogens

Meghan Noseworthy[1], Angela Dale[1], Esme John[1], Eric Allen[2], Chris MacQuarrie[3], Veronique Martel[4], Josie Roberts[5], Tyranna Souque[1]

[1] Canadian Forest Service, Natural Resources Canada, Pacific Forestry Centre

[2] Retired

[3] Canadian Forest Service, Natural Resources Canada, Great Lakes Forestry Centre

[4] Canadian Forest Service, Natural Resources Canada, Laurentian Forestry Centre

[5] Canadian Food Inspection Agency

Efficacy data for treatments that reduce pest risks are integral to the development of standards for phytosanitary measures. Quantifying the lethal dose for pests of wood products provides confidence in current heat treatment schedules used to trade wood safely. Research to identify the precise lethal dose (temperature and time) required to address pests in wood products using a carefully calibrated heat treatment apparatus is ongoing in Canada. Findings of the past 5 years were presented, including the precise lethal dose for wood borers, pathogens and contaminating pests both indigenous and invasive to Canada.

Several pests and pathogens have been tested, and the minimum lethal dose was below the ISPM 15 treatment threshold in every instance.

Future work includes looking at different life stages for various pests to explore thermotolerance, testing pests in wood, testing multiple isolates of pathogens to determine the optimal sample size, testing the age of mycelium effects.

The apparatus is part of a NAPPO project to perform a ring study with countries in the NAPPO region, and potentially beyond the region, to test other pests and replicate tests to further verify lethal dose.

9.3 A preliminary tolerance screening of wood-infecting fungal species submitted to treatment temperatures recommended in ISPM 15

Jean-Marc Henin (Centre wallon de Recherches agronomiques), Bricmont F., Schmitz S., Jourez B., Chandelier A.

Both temperature/duration schedules approved in ISPM15 as HT and DH mainly rely on data related to insects and nematodes. The efficiency of these treatments against fungi is more questionable, some authors having evidenced the tolerance of certain fungi to these treatments. In the frame of a wider study aiming at assessing the efficiency of HT & DH on different fungal species, the authors presented some results of a pre-screening of thermotolerant fungal species.

Five different fungi survived tests when exposed to 56 and 60 C for 30 minutes in a petri dish.

Based on the tests, a secondary test was developed and is being performed to treat wood specimens with HT and DH (according to ISPM 15 schedules) that have been inoculated with fungi. Nine different fungi are being tested. The results will be presented in the future.

An IFQRG member suggested that it would be worthwhile to replicate this study with the Humble Water Bath to see if survival seen in this study occurs under different testing conditions.

9.4 Research on pine wilt disease in China

Yongxia Li (Ecology and Nature Conservation Institute, China Academy of Forestry)

A brief introduction on the research progress on epidemiological and pathogenic mechanisms of PWN, and environment-friendly Integrated Prevention and Control Technology of PWD in China will be provided. At the same time, highlights on the early rapid diagnosis technology of pinewood nematode in the field.

- 18 of 22 provinces have trees that are infected with PWN in China
- To control PWN, China is monitoring trees for infection, removing infected trees (and either heat treating or wrapping to prevent *Monochamus* spread), injecting infected trees as early as possible to kill PWN, controlling the *Monochamus* vector through quarantine zones.
- Applying a new detection method that allows for rapid field detection – alliance card/microdetector
- Despite concerted efforts to control the spread of pine wilt, it continues to spread in China.

Next steps:

- Looking for collaborative partnership to better understand behavior of PWN in China versus North America

Action Item: IFQRG members with experience in Pine wilt disease may contact Li for collaboration.

9.6 Dielectric heating certification update

Ron Mack (USDA-APHIS)

A summary of the dielectric heating (DH) technology and adoption of DH treatment into ISPM 15 was given. Although it has been adopted since 2013, it is not currently being used in practice because operational understanding had been lacking to properly certify it for inclusion into any wood packaging certification programs. To advance to certification, over the past several years, operational research has been performed to improve treatment consistency, understand treatment parameters, and develop operational guidance to attain certification in North America.

9.7 Vacuum pressure impregnation with wood preservatives to eliminate pinewood nematode from wood

Paulo Verdasca, Luís Fonseca, Isabel Abrantes

Wood products that are impregnated with preservatives that are exported require a secondary heat treatment to comply with 56/30. It is desired to determine if the preservative treatment can effectively kill pests so that the secondary HT treatment would not be necessary.

Samples were prepared from trees infested with PWN and then impregnated with three different wood preservative according to typical industrial conditions. The samples were then tested for PWN presence.

Conclusions:

- Mortality in all instances was higher than 99.9968%
- In instances of survival, no population growth was detected
- Variables such as wood diameter, moisture content, preservative type, and impregnation pressure can affect treatment efficacy
- Fatality resulted from the combination of physical and chemical exposure

It was noted that if progress toward VPI treatment approval is desired, the Portuguese NPPO should be consulted.

10. New tools, technology and research

10.1 Surveillance and detection of potentially harmful organisms using long-read sequencing tools in forest pathology

Jana Mittelstrass*[1], Quirin Kupper[1], Ludwig Beenken[2], Valentin Queloz[2], Simone Prospero[1]

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[2] Swiss Forest Protection, Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Birmensdorf, Switzerland

*Presenting author

To prevent non-native and potentially invasive pests from being introduced into Europe, for example through global trade of living plants or plant parts, phytosanitary efforts like the monitoring of areas with high risk of introductions as well as regular diagnostics are indispensable. A general overview of the experimental design of the annual territory surveillance for forest pests and pathogens in Switzerland using spore and funnel traps was presented.

Additionally, the authors introduced and evaluated the potential and challenges of different molecular tools using long-read sequencing technologies (PacBio, Oxford Nanopore Technologies (ONT)) that have recently been used in the laboratory on different diagnostic samples in order to detect target (ONT) and non-target (PacBio) organisms. PacBio sequencing, due to high sequencing quality, is a good alternative to standard High Throughput Sequencing tools investigating diversity, while ONT is mainly used for the targeted detection of specific quarantine organisms.

Overall, the technologies require more development and refinement before they become viable, but potential exists for their implementation in the future for use in detecting the presence of forest pathogens.

10.2 The assessment of tree seed mycobiomes using Illumina and Nanopore metabarcoding and traditional plating

Jana Mittelstrass[1], Renate Heinzelmann[1], René Eschen[2], Martin Hartmann[3], Quirin Kupper[1], Salome Schneider[1], Simone Prospero[1], Iva Franić[1]*

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*Presenting author

Understanding seed mycobiome diversity and potential impacts of seed-borne fungi in seedlings is crucial for securing plant health. While traditional culturing is laborious and limited in revealing fungal diversity, metabarcoding allows the simultaneous detection of fungal taxa directly from multiple plant tissue samples. Short-read metabarcoding using for example Illumina platforms results in many unidentified taxa or taxa without assigned lifestyles. By comparison, sequencing of longer marker gene fragments may improve species and genus assignments. We assessed fungal communities in the same seed samples with traditional culturing, short-read Illumina metabarcoding and long-read metabarcoding using Oxford Nanopore Technologies (ONT) and compared taxonomic and functional fungal diversity across methods.

- Conclusions
    - Short-read metabarcoding is optimal for fungal diversity screening due to high sequencing depths and diversity coverage.

- As error rates decrease, reference databases expand, and throughput improves, long-read metabarcoding may become a strong candidate for future diagnostic studies of fungi.
- Traditional culturing captures most of the fungi from short-read metabarcoding and remains valuable for obtaining isolates for further research.
- Combined approach recommended for complete and accurate assessment of fungal pathogens needed for phytosanitary risk assessment.

Virtual Session – Thursday November 7th – Day 4 – 15:00 to 17:00 PM CET

Virtual participants (approximately 30)

11. Phytosanitary measures and guidance for wood chips

Chair, Chris Howard (DAFF, Australia) welcomed the in-person and virtual attendees to the second virtual session on Wood Chips. This session is aimed at providing discussion and feedback to EPPO for the guidance document being created.

11.1 EPPO standard for monitoring and consignment inspection of wood chips, hogwood and bark for quarantine pests

Dominic Eyre (Department for Environment, Food and Rural Affairs DEFRA, UK)

The EPPO inspection panel drafted a standard on inspection and monitoring of wood chips which was approved in 2019. At the time the standard was drafted there was very little published information on the trade in wood chips, hogwood and bark and how the risk should be assessed. Other challenges for inspection and monitoring are the huge volumes that can be traded, the range of particle sizes in single consignments, the difficulty of obtaining a representative sample and also determining the species of trees that the wood has come from. One of the aims of the standard was to encourage NPPOs in the EPPO region to carry out some monitoring and inspection of wood chips to enable a better understanding of the risk.

Additional information: EPPO standards development described. EPPO standard development recommended for wood chips, however the volume of wood chips, consignment size, lack of uniformity in species and size, origin were challenges identified. Definitions used included bark (ISPM 5), wood chips and hogwood and international HS customs codes. Size is classified by the European size classes. Treatment (kiln drying, heat treatment, fumigation, aerobic composting, wood chipping) factors depend on end use (energy, chip board, paper production, mulch). Note: mulch has bark and is considered high risk. Therese Poland's work on chipping and EAB noted.

Advice on inspection include prioritize based on risk: origin, types of wood, time of year, destination, compliance record. Inspect at least 20 locations across commodity. In addition to inspection monitoring in the region with trapping and detection dogs.

EU looking at wood chips to replace peat moss around plants grown for planting due to environmental reasons.

Questions: Intended use in practical terms, when wood chips are imported is intended use indicated. A: Not necessarily but destination is known and extrapolation is possible (e.g. paper).

Q: If an inspector found evidence of a pathogen or insect galleries in wood chips would the commodity be allowed if not a quarantine pest? A: Practically speaking, it would be hard to hold up a shipment based on symptoms without lab results.

Q: Mitigation and control of risk and end use. We should be able to tighten up the chain of custody for example power plant for burning. If we can tighten up this what can we do? Also, chips in the paper industry this is contractually controlled due to the quality of the chips size and moisture needed (fines or seps), monitory incentive works as a control. This adds a layer of control which is not phytosanitary. A: Chain of custody does happen so when pests are found there is admin and paper work follow up. This is done when things go wrong rather than a routine process. And commercial incentives are effective.

Intended use or end use in Canada permits are used, before import the company describes what they do to contain risk and then this is reviewed. This requires resources.

Q: Could participants share views on what action they would take regarding findings of live, non-quarantine organisms within imported consignments of chipped wood or isolated bark? If the findings are indicative of phytosanitary treatments failing prior to export what remedial action is appropriate?

A: This has been discussed in regard to lumber and chips. There needs to be a process if not a quarantine organism what do regulators do. Need strong policy that is justified to determine if an organism is present that should have been mitigated by the treatment does this suggest a quarantine organism may be present? Example: mold that is not quarantine.

Second part of the questions - does this indicate treatment failure- regulated quarantine pest, if there is a surviving organism that is clearly associated with wood or a non-regulated bark beetle this is a clear indication that treatment failed and thus justification that action may be taken. Choices are to reject, treat etc.

Example importing plants from outside UK and nematodes non-quarantine in soil. They will be destroyed. Tree ferns requirement for fumigation if live invertebrates lead to destruction and reporting to the exporting country. Mitigate the risk with treatment with the lowest impact if this is to treat it rather than send it back; this is done.

In some cases experts are consulted to determine if the infestation is an indication of treatment failure of infestation post-treatment.

11.2 EPPO Guidance document for managing the risks associated with international trade in wood chips

Dmitrii Musolin and N. Horn (European and Mediterranean Plant Protection Organization, EPPO/OEPP)

The global trade in wood chips is enormous and dynamic. Movement of this commodity poses a risk of introduction and spread of pests (mainly insects, but also other pests such as nematodes and fungi). To address the current phytosanitary concern that affects the trade in wood chips, the Panel

on Quarantine Pests for Forestry of the European and Mediterranean Plant Protection Organization (EPPO) initiated in 2022 work on a guidance document which will focus on management of the risks associated with international trade in wood chips. We plan to describe the phytosanitary risks; industrial process(es) of wood chips production; review wood chip size limits applied by industries, outline what conditions prevail during production, storage, and transport and what factors would indirectly reduce the phytosanitary risks, consider what measures can be taken to prevent (re)infestation of wood chips, including during international transport and storage and how the effectiveness of such measures might be assessed by regulatory authorities and/or how measures may require regulatory oversight. Colleagues are invited to discuss these topics and contribute to development of the Guidance document.

Additional information: 2013 study recommended on chips, bark sawdust and wood waste commodities due to lack of data on these commodities. Expert working group was established. In 2015 this group wrote the *EPPO study on wood commodities other than round wood, sawn wood and manufactured items* (Tech Doc no 1071). In this document there is a small chapter on wood chips. It lists uses of wood chips (mulch, pulp, fuel, smoking/grilling barbeque). Pest risk depends on pest presence in original material, bark and size. It considered uncertainties associated with measures and treatments and costs associated with different treatments including environmental effects. Sampling to detect organisms on import is difficult.

In 2022, EPPO Panel on Quarantine Pests for Forestry started work on a Guidance document for managing the risks associated with the international trade in wood chips. This document will identify factors affecting risk, characteristics of wood chips, production, storage, transport cond and intended use. This may lead to a EPPO standard. To assess risk, information is needed from exporting countries, describe industrial processes, size limits, and national, regional, and international standards.

Working group: X. Tassus, JM Henin, A. Uzunovic, C. Howard, T. McDonald, N. Horn, D. Musolin.

Asked for information from countries but most NPPOs indicated they didn't have this info. Canada helped with a table to collect. Current structure of the document: background, definitions, local use and international trade, Phytosanitary risks, practices in production, Management practices, end use considerations, chain of custody, power of contract, treatments and systems approaches and guidance to NPPOs. NOTE: there are many gaps in the collected information and in current knowledge. People are welcomed to join the working group.

Questions: When the survey was put together, how was this dispersed? A: NPPOs are the main contact and RPPOs. NAPPO sent it to Canada, USA and Mexico for example. The original letter was a list of questions.

11.3 Definition, production, markets & trade of wood chips

Jean-Marc Henin (Centre wallon de Recherches agronomiques), Xavier Tassus (Anses), Dmitrii Musolin (EPPO), Chris Howard (DAFF), Adnan Uzunovic (Canada Wood)

Fragmented wood includes a wide variety of product types utilizing a variety of particles of different sizes and origins. These products can be in form of wood chips, hog fuel/hogwood, fragmented wood residues, wood shavings, sawdust and wood flour; they can be produced from domestic or imported

trees that may be infected by pests, from larger logs or just branches and debris, or from lumber (secondary wood transformation). Understanding the production, transport and storage of these commodities is important in order to evaluate and quantify the pest risk and develop successful pest risk management practices. Accepted and consistent international terminology for fragmented wood appears important to avoid confusion on meaning and interpretation between countries, which may result in the application of unnecessary phytosanitary measures. Typically, wood chips produced at a tree-harvesting site (whether from whole trees or from debris) are used mainly for the energy sector, and often contain significant percentage of bark. These chips are typically never mixed with higher grade bark-free chips, like those destined for pulp and paper production or other quality products (e.g. wood-based panels). For these higher quality chips, a more rigorous selection of wood source is generally applied by screening and air drying to produce a more desirable chip for those applications. At global scale, chips intended for pulp and paper represent ca. 90% of chips trade; around 5-7% are destined for wood-based panels, and only 0.5-3% for other uses (energy, mulching, animal bedding, etc.). The presentation will review the topic and hopefully engender additional input to better understand how well-defined the wood fragment category is globally, identify chips sources and intended use, and lastly ascertain the easy of adjusting, monitoring and controlling production in the context of addressing pests' risks and control.

Additional notes: Definition of Wood chips from ISO 24294:2021 and ISO 17225-1:2021. The second definition says wood chips are between 5-100mm produced with sharp blades. And ISO 16559:2022 (5-50mm) with sharp tools. Given these definitions chips should not be confounded with wood chunks (chunkwood, hog fuel, shredded wood, etc.).

The use of sharp knives are an important aspect of chip production. Paper and panel industries use high quality chips (they do not have bark). 90% of chips traded internationally are used in paper production. A small amount is used for energy production.

Bark is used for energy production in the paper industry.

Methods of fragmented wood production include: chipping, shredding, and grinding to produce a variety of products including but not limited to paper, fiberboard, energy, animal bedding, and mulch. The EPPO guidance document will seek to define and distinguish between the types of production and products.

A questionnaire was sent to NPPO/RPPOS.

The global export of wood chips is 23 million tonnes per year (Allen et al. 2017).

It is important to ensure consistency between the definition of chips and the scope of the guidance document and to identify whether some high-risk commodities travel between continents. Markets fluctuate with changing export routes, and it is difficult to have reliable statistics on trade due to a variety of custom codes and year-to-year variations in volumes, trade sources, etc.

Questions:

Q: How will different definitions fit into the guide? A: The wording in the legislation for the EU 2019 2072. Only mention 'wood in the form of chips'. For the guidance a new definition will be used.

Q: Can anyone think of a pest which has established which has moved on wood chips? It is difficult to correlate. A: It is unclear whether the wood chip pathway is a vector for invasive pests. The group

noted that further investigation may be warranted to determine actual risk of pest establishment linked to this pathway.

Comment: Wood chips without the vector can transmit nematodes to a tree if wounded. Nematodes can move in the soil. If wood chips are spread on damaged tree trunks they can potentially move into the tree.

Comment: PWN can go from sawdust to soil and enter wounds.

11.4 Phytosanitary risks and quarantine pests associated with wood chips

Adnan Uzunovic (Canada Wood), Ron Mack (USDA), Xavier Tassus (anses), Jean-Marc Henin (Centre wallon de Recherches agronomiques), Chris Howard (DAFF), Dmitrii Musolin (EPPO)

Wood chips represent fragmented wood of variable size, moisture content, and percentage of remaining bark. Chips as a traded commodity may contain pests of concern to importing countries. To properly assess pest risk associated with chips in trade, a comprehensive review of the entire process from initial production, through chain of custody, to final use is instructive The precise definition and control of chip production, storage and delivery, the origin of chips (e.g. country and tree species), level and type of pest infestation of the source material and its processing, species of remaining pest after processing, presence of bark, chips' size and moisture prior to and during transport, handling and storage and end use of chips are some of the key factors determining the phytosanitary risk of wood chips. In addition, the potential survival of post-production pests and their ability to escape and establish in new environment are other important factors that regulators should consider. This presentation will review these factors, list the knowledge gaps or discussion points and ask for additional input to jointly review and discuss pest risk assessment of this commodity.

Additional Notes: Pest risk associated with wood chips is a function of origin, handling and use, initial pest infestation.

Pest potential - ISPM 39 *International movement of wood* Section 4.2.3 describes pest mitigation options. Publications include MuCullough et al 2008 (EAB) - 2.5 cm screen was effective to ensure no EAB survival.

It may be challenging to analyze the pest risk associated with wood chips because of their size. Determining the risk associated with chip size and bark could be addressed in a manner similar to the approach taken for bark tolerance in ISPM 15. Work by Haack and Brokerhoff 2009 and IFQRG 2007 should be consulted.

Comment: Sometimes trade specifications are precise because the quality has to be controlled. This is referred to as the Power of Contract, as such it can be controlled. The guidance material should take this into consideration.

Comment: EU legislation considers global recommendations, e.g. fumigation. Until someone asks for a treatment it cannot be added to the legislation.

11.5 Treatments/ measures/ management practices for wood chips to eliminate and manage pest risk in international trade

Jean-Marc Henin (Centre wallon de Recherches agronomiques), Ron Mack (USDA), Adnan Uzunovic (Canada Wood), Thomas Schröeder (BMEL), Christopher Howard (DAFF), Xavier Tassus (anses), Dmitrii Musolin (EPPO)

Wood chips as a commodity are important to numerous countries especially with the emerging energy needs. As the availability of the commodity fluctuates there could be a significant surplus of wood chips in some countries and large need and interest to obtain it by other countries. Often, that trade is impacted based on how the pest risk is being evaluated and if approved efficacious and economic treatments/management measures are available. These measures need to be affordable and feasible for the industry due to low value of this commodity. The industry is important part of a search for a technical solution that will satisfy required risk reduction by the regulators. Unless the benefit exceeds the investment required, the treatment will not be applied, regardless of how effective it is. The source and types of wood chips may vary in regard to pest risk, as well as large number of potential destinations and uses. The risk could perhaps be addressed by using economical phytosanitary treatments/management practices tailored for specific scenarios. For example, some treatments/measures may address specific trade/ commodity/ destination and target pest that could be negotiated bilaterally (between the exporting and importing countries) while other management practices/ treatments may be agreed or adopted that are universal for chips trade addressing numerous possible pests, trades and scenarios for wood chips as a commodity.

Some possible measures may include controlling origin, size and quality, debarking, drying and treatments of wood chips to significantly reduce/eliminate pest. The latter may include the use of heat such as solar energy as a cheap source of heat, hot water baths, steaming chambers, vapor heat, dry heat/forces hot air heat in kilns, electromagnetic waves (DH), chemicals treatments, etc. Various management practices and affordable treatments may be combined in a systems approach. Evaluation of feasible solution may include looking into pest reduction/elimination through targeted wood processing (e.g. pellet production in the country of origin). This paper aims to review treatments and offer an initial cost benefit analysis and encourage group to discuss possible and feasible solutions.

Additional notes: Chips resulting from the mechanical transformation of round wood - smaller the particles the lower the risk for insects. However chipping probably doesn't impact fungi and nematodes.

There are no biological invasions attributable to wood chips.

Treatments are available: HT 56/30 technically feasible; Dielectric heating potential; Chemicals or pesticides (residue and handling considerations); fumigation potential (ISPM 43); modified atmosphere (ISPM 44); irradiation (ISPM 18) unknown as a potential treatment.

Measures that lower risk include: debarking, reducing particle size, controls on transport, and storage conditions (covering, avoid contamination, etc.)

Conclusions: There are many treatments and phytosanitary measures available including systems approaches. Cost effectiveness is an important consideration when choosing a phytosanitary

measure because this is a low value commodity. Treatments must be approved based on their efficacy, feasibility of delivery and profitability.

Q: Do chips for pulp require a high moisture content? A: Yes, they are required to be green 25-45% MC.

Comment: The infrastructure for conveyor belt style treatment (e.g., for plastics) is expensive initially. Perhaps this is an option for wood chips. Electron beam delivery of irradiation for grain has been used and was initially very expensive yet today are more affordable. There is a need for the technique to be available first (see EPPO standard).

Q: Is acetylation a commercially viable treatment for wood chips? Acetylation is a type of modification of wood. There is some trade using acetylation. It reduces moisture content. Not sure if it is commercially viable. A: This could be an option to look into. This could be a part of a systems approach as well.

11.6 Evaluating systems approaches/ chain of custody to significantly reduce pest risk in international trade of wood chips

Meghan Noseworthy (CFS)

A systems approach may be an effective, affordable and practical option to manage risk and facilitate safe trade of wood chips. It may integrate independent risk management measures, some typically used in wood chips production, which cumulatively address and significantly reduce pest risks that may not be fully managed or economical by a single measure. Some aspects of this approach may include controlling the origin and quality of wood chips prior to shipment, debarking and drying, use for specific controlled products, controlled enforced destination and end use and addressing downtime in receiving mills and potential of relocating wood chips for alternative uses. Maintenance of the integrity of wood chip lots throughout the process, having designated harvest and shipping periods and controlled land transport and storage may be included in a systems approach. Additional measures may include: inspection before shipping, moving wood chips only during winter months when biological activity of some pests is minimal, and specific handling and control on import. Key knowledge gaps include detailed and documented assessment of elements and options for monitoring and quality control that may be considered the responsibility of both exporting and importing NPPOs.

Design of a systems approach may include detailed knowledge of the chain of custody as well as using Power of Contract that may exist between reliable and interested parties of sellers and buyers. This paper will summarize key aspects and knowledge gaps in the context of recently adopted NAPPO standard on System approaches for forest Products RSPM 41.

11.7 Regulator and industry perspectives on wood chip trade TBD

Christopher Howard (Biosecurity Plant and Science Services Division, Department of Agriculture, Fisheries and Forestry DAFF, Canberra, Australia)

Regulatory governance to manage phytosanitary risk (i.e. pests of concern that may be present on the pathway) to an acceptable level is crucial for safe trade. In the absence of a commodity-specific

international phytosanitary standard that explicitly examines and details management of wood chip phytosanitary risk, regulators must rely on their own determination of the risk that traded wood chips presents and how this can be reduced to an acceptable level. To determine whether phytosanitary measures are required to reduce risk, pest risk assessment should consider: country/region of origin and pest status; production practices; storage; modes of arrival (bulk, packaged); end use; etc. Some, or all, of these factors may contribute to the phytosanitary risk rating. Regulators can then use this to determine the appropriate measures/management options to be applied. Appropriate legislation is also required to enable any regulatory enforcement in the country of production or to allow any remedial phytosanitary action once the commodity arrives in the importing country. General guidance on phytosanitary risks and applicable and practical phytosanitary measures will assist regulators to effectively manage trade of this commodity, and potentially lead to harmonisation of trade.

Additional notes: Consider technical justification - PRA process, how do we determine the appropriate level of protection.

Legislative considerations:

- Is an NPPO legally able to impose measures?
- For example in the case of systems approaches or pre-shipment treatments - can we legally perform remedial treatments or refuse consignments?
- Can end use be legally controlled (environmental use).
- One Health considerations and animal health. When wood chips are stored they can be contaminated with bird feces and could be a pathway for other harmful pests.

Operational Considerations:

- Is a treatment used or available and registered.
- What is the capability of auditing?
- Is the verification and inspection practical?
- Are port facilities adequate?
- Can the port facility accept the product?

Discussion: Collaborative research thoughts for IFQRG:

- What is the risk associated with chips?
- What is the likelihood of pests associated with wood chips based on biology (refer to ISPM 39 pest grouping).

END of Virtual Session – Thursday November 7th – Day 4 – 15:00 to 17:00 PM CET

Day 5

Recap of Day 5 - The Chair, Chris Howard reviewed Day 4 items and conclusions. Considerations for the phytosanitary measures options for wood chips. Comments are welcome, please send them to Dmitrii Musolin. Barbara Peterson (CFIA, Implementation Capacities Committee) will be visiting today and will update the group on the additional guides on heat treatment which will be appended to ISPM 15 Guidance (DE heating and fumigation).

12. Other Business

12.1 Topics for next year

- Seeds, plants for planting.
- Potential advancements in molecular identification, including validation. Broader applications of eDNA including wood chips. Input from experts on where the technology is going and how it can contribute to IFQRG interests.
    - Molecular tools group - identification and interpretation. How can these tools affect trade and communication between NPPOs.
    - Comparing molecular tools to standard tools and encouraging.
- Interception vs Establishment.
- Dose vs Delivery.
- Broader topics or experts on larger projects (e.g. AI or use of drones for forest quarantine activities, FORSAID, Andrea Battisti).
- Industry reports- what is happening in the field with ISPM 15 compliance.
- Pathogens in trade, and potential heat tolerance.

12.2 For IFQRG 22

- Locations - New Zealand as potential location, Rome, Paris, Berlin (EPPO office but only holds 27), China (Li may be able to provide host location)
    - Need in-kind donation for meeting space and technology for virtual meeting.
- Try to reach more NPPO representatives.
- Date is to be determined but the target will be Late September to early December, pending facility availability of host.

12.3 Science Steering Committee

IFQRG has Rules of Procedure and Terms of reference on the IFQRG public page. The SSC is made up of 7-9 representatives.

IFQRG SSC member Thomas Schroeder read the list of IFQRG members nominated for the SSC in compliance with the IFQRG Rules of Procedures that included representation from five IPPC regions, and asked for feedback from meeting participants.

All IFQRG members present at the time of the discussion approved the motion to appoint the following IFQRG members as members of the IFQRG Science Steering Committee (SSC), in no particular order:

Dr. Eric Allen Canada (NAPPO)

Dr. Kelli Hoover USA (NAPPO, PPPO)

Dr. Christopher Howard Australia (PPPO)

Ron Mack USA (NAPPO, PPPO)

Dr. Maya Nehme Lebanon (NEPPO)

Meghan Noseworthy Canada (NAPPO)

Dr. Michael Ormsby New Zealand (APPPC, PPPO)

Dr. Stephen Pawson New Zealand (APPPC, PPPO)

Dr. Thomas Schroeder Germany (EPPO)

Dr. Adnan Uzunovic Canada (NAPPO)

12.4 IPPC Guidance Document Wood Packaging Material

Chris Howard gave a summary on the development.

Guest Barbara Peterson summarized the document and updated the group on manual usage.

There were two treatment manuals drafted as annexes to the Guidance Document, one for Fumigation and one for Heat Treatment. The drafts were sent out for public comment and many were received. The drafts with comments will be taken to the IPPC Standards Committee to consider placing on the work program of the TPPT. If agreed the TPPT will respond to the country comments and revise accordingly.

14. Review and finalize the Meeting Report

The IFQRG members present reviewed and finalized the meeting report.

15. Close of Meeting

The Chairs, Eric Allen and Chris Howard thanked the group for the meeting. Chris Howard also thanked the FAO for allowing us to be in the building and the IPPC Secretariat (Avetik Nersisyan, Artur Shamilov, Colleen Stirling, and Barbara Peterson) for providing expertise and technical support and Meghan Noseworthy for organization of the meeting, Brad Gething for being the Rapporteur, and to the members present for progressing forest quarantine. Members concurred.

2024 Symposium Participants

First	Last	Country	Affiliation
Naima	Ait Oumejjout	Canada	Canadian Food Inspection Agency (CFIA)
Eric	Allen	Canada	IFQRG Science Steering Committee
Dan	Berry	UK	CHEP, Brambles
Natalia	CanoMarimon	Rome	Food and Agriculture Organization (FAO)
Paul	Conway	USA	American Lumber Standards Committee (ALSC)
Jill	Dalton	Canada	CFIA
Dominic	Eyre	UK	Department for Environment, Food and Rural Affairs (DEFRA)
Iva	Franic	Switzerland	Swiss Federal Institute for Forest, Snow and Landscape Research (WSL)
Scott	Geffros	Canada	Canadian Wood Pallet and Container Association (CWPCA)
Brad	Gething	USA	National Wooden Pallet & Container Association (NWPCA)
Mark	Hamelin	Canada	RF Kiln Tech Limited
Caren	Helbing	Canada	University of Victoria
Jean-Marc	Henin	Belgium	Walloon Agricultural Research Centre
Chris	Howard	Australia	Department of Agriculture, Fisheries and Forestry (DAFF)
Jacob	Imbery	Canada	University of Victoria
Dave	Kretschmann	USA	American Lumber Standards Committee (ALSC)
Hajeong	Lee	Canada	University of Victoria
Ron	Mack	USA	USDA-APHIS
Adriana	Moreira	Rome	IPPC
Dmitrii	Musolin	EU	EPPO
Avetik	Nersisyan	Rome	IPPC
Paul	Newman	Canada	Canada Wood
Meghan	Noseworthy	Canada	CFS-NRCan
Jana	Orbach	Switzerland	WSL
Gerardo	Sanchez Pena	Spain	Ministry of Agriculture, Fisheries and Food
Shiroma	Sathyapala	Rome	FAO
Thomas	Schroeder	Germany	Federal Ministry of Food and Agriculture (BMEL)
Artur	Shamilov	Rome	IPPC, FAO
Xavier	Tassus	France	Agence Nationale de Sécurité Sanitaire Alimentation
Vanessa	Thompson	Canada	University of Victoria
Adnan	Uzunovic	Canada	Canada Wood
Paulo	Verdasca	Portugal	MADECA
Li	Yongxia	China	China Academy of Forestry
Zhang	Xingyao	China	China Academy of Forestry

Virtual Participants

First	Last	Country	Affiliation
Norman	Barr	USA	USDA - APHI S - PPQ - PEIP
Guillaume	Billodeau	Canada	CFIA
Gwylim	Blackburn	Canada	CFS-NRCan
Luís	Bonifácio	Portugal	Portuguese National Research Institute for Agrarian and Veterinary
Ian	Brownlee	UK	Northern Research Station
Pragyan	Burlakoti	Canada	British Columbia Ministry of Agriculture and Food
Anne	Chandelier	Belgium	Département sciences du vivant, Unité sante des plantes et forets
Gerard	Clover	UK	Forest Research
Angie	Dale	Canada	CFS-NRCan
Bart	de Graaf	The Netherlands	Netherlands Food and Consumer Product Safety Authority
Maria	De Lurdes Inacio	Portugal	National Institute for Agriculture and Veterinary Research
Jessica	Devitt	New Zealand	MPI
Manoj	Dubey	India	Institute of Wood Science and Technology
Jean-Francois	Dubuc	Canada	CFIA
Rachael	Edwards	UK	Forestry Commission
Papa Massar	Fall	Sengal	ONPV Sengal, Responsible de la Quarantine
Nicholas	Feau	Canada	CFS-NRCan
Hugo	Frechette	Canada	CFIA
Leonardo	Galindo Ganzalez	Canada	CFIA
Tane	Geldard-Lorenz	NZ	SPS Biota
Leigh	Greenwood	USA	The Nature Conservancy
Bob	Haack	USA	USDA-APHIS
Ari	Hietala	Norway	Norwegian Institute of Bioeconomy Research
Farzad	Jahromi	Australia	DAFF
Wim	Jennes	Belgium	Federal Agency for the Safety of the Food Chain
Esme	John	Canada	CFS-NRCan
Magdalena	Kacprzyk	Poland	The Agricultural University of Krakow
Stacey	Kus	Canada	FPInnovations
Isabel	Leal	Canada	CFS
Shamina	Maccum	Canada	CFIA
Damien	Maher	Ireland	Department of Agriculture, Food and the Marine
Sarbjit	Mann	Canada	CFIA
Mireille	Marcotte	Canada	CFIA
Veronique	Martel	Canada	CFS
Petya	Mateva	Bulgaria	Department of Forest Management
Brendan	McDonald	New Zealand	MPI

First	Last	Country	Affiliation
Tom	McDonald	Ireland	Department of Agriculture
Scott	Myers	USA	USDA-APHIS
Nathan	Miller	USA	USDA-APHIS
John	Morgan	UK	Forest Research, Northern Research Station
Mike	Mullin	Australia	CHEP
Scott	Myers	USA	USDA-APHIS
Mike	Ormsby	New Zealand	MPI
Tod	Ramsfield	Canada	CFS-NRCan
Josie	Roberts	Canada	CFIA
Katarzyna	Sikora	Poland	Forest Research Institute
Tyranna	Souque	Canada	CFS-NRCan
Joey	Tanney	Canada	CFS-NRCan
Anne Sophie	Van Bruggen	The Netherlands	NIVIP Nematology
Arvind	Vasudevan	Canada	CFIA
Biplang	Yadok	New Zealand	MPI
Taylor	Whitman	UK	Forest Research
Tiina	Ylioja	Finland	Natural Resources Institute Finland

Pictured left to right (back row): Adriana Moreira, Jacob Imbry, Dominic Musolin, Jana Orbach, Iva Franich, Scott Geffros, Paul Newman, Brad Gething, Hajeong Lee, Dave Kretschmann, Ron Mack, Paul Conway, Thomas Schroeder, Adnan Uzunovic, Avetik Nersisyan, Meghan Noseworthy, Eric Allen, Naima Ait Oumejout, Chris Howard, Xavier Tassus, Artur Shamilov, Mike Ormsby, (Front row) Marina Martino , Caren Helbing, Dominic Eyre, Vanessa Thompson, Mark Hamelin, Gerardo Sanchez Pena, Jean-Marc Henin.

[1] Additional resources: IFQRG Work Area – 2023 Proceedings

List of Abbreviations

ALSC	American Lumber Standards Committee
ANSES	Agence Nationale de Sécurité Sanitaire Alimentation, environnement, travail
APPPC	Asia Pacific Plant Protection Commission
CFIA	Canadian Food Inspection Agency
CFS	Canadian Forest Service
CLSAB	Canadian Lumber Standards Accreditation Board
CPM	IPPC Commission on Phytosanitary Measures
CRADA	Cooperative research and development agreement
CWPCA	Canadian Wood Pallet and Container Association
DH	Dielectric Heating
EAB	Emerald Ash Borer (*Agrilus planipennis*)
EDN™	Ethanedinitrile (C2N2)
EPPO	European and Mediterranean Plant Protection Organisation
FAO	Food and Agriculture Organization
FPSA	Forest Products System Approach
HACCP	Hazard Analysis and Critical Control Points
HT	Heat Treatment
IFC	IPPC Implementation and Facilitation Committee
IFQRG	International Forestry Quarantine Research Group
IFU	Implementation and Facilitation Unit
IPPC	International Plant Protection Convention
IPRRG	International Pest Risk Research Group
IRSS	Implementation Review and Support System
ISPM	International Standards for Phytosanitary Measures
ISPM15	ISPM No. 15 *Regulation of wood packaging material in international trade*
ISPM28	ISPM No. 28 *Phytosanitary treatments for regulated pests*
ISPM42	ISPM No. 42 *Requirements for the use of Temperature Treatment as Phytosanitary Measures*
IUFRO	International Union of Forestry Research Organizations
IYPH	International Year of Plant Health
MBr	Methyl bromide
MPI	Ministry of Primary Industries

MW	Microwave
NAPPO	North American Plant Protection Organization
NEPPO	Near East Plant Protection Organization
NGS	Next Generation Sequencing
NPPO	National Plant Protection Organisation
OECD	Organisation for Economic Co-operation and Development
OTUs	Operational taxonomic units
PCE	Phytosanitary Capacity Evaluation
PMRG	Phytosanitary Measures Research Group
PWN	Pine Wood Nematode (*Bursaphelenchus xylophilus*)
RoP	Rules of Procedure
RPPO	Regional Plant Protection Organisation
SC	IPPC Standards Committee
SSC	IFQRG Science Steering Committee
STDF	Standards and Trade Development Facility
ToR	Terms of Reference
TPFQ	IPPC Technical Panel for Forest Quarantine
TPPT	IPPC Technical Panel for Phytosanitary Treatments
USDA-APHIS	United States Department of Agriculture- Animal and Plant Health Inspection

The Mission of IFQRG

The mission of the International Forestry Quarantine Research Group (IFQRG) is to support and address critical forestry quarantine issues for the global plant health community through scientific analysis, discussion and collaborative research.

IFQRG is an independent, open international body providing scientific analysis and review of global forestry-related phytosanitary issues. The IFQRG serves as a forum for the discussion and clarification of key issues related to the phytosanitary implications of global trade with forest plants and products.

IFQRG's goal is for membership to include global representation from scientific, industrial and phytosanitary organizations from both developed and developing nations. Membership is open to suitably qualified individuals who have demonstrated expertise in disciplines relevant to plant health. IFQRG endeavors to recruit members from all FAO regions.

To become a member of IFQRG, the individual submits a short biography or curriculum vitae to the Science Steering Committee (SSC) outlining research or other relevant experience. Membership applications will be accepted by the SSC if information on the applicant indicates they would be a suitable member of IFQRG. There is no membership fee.

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