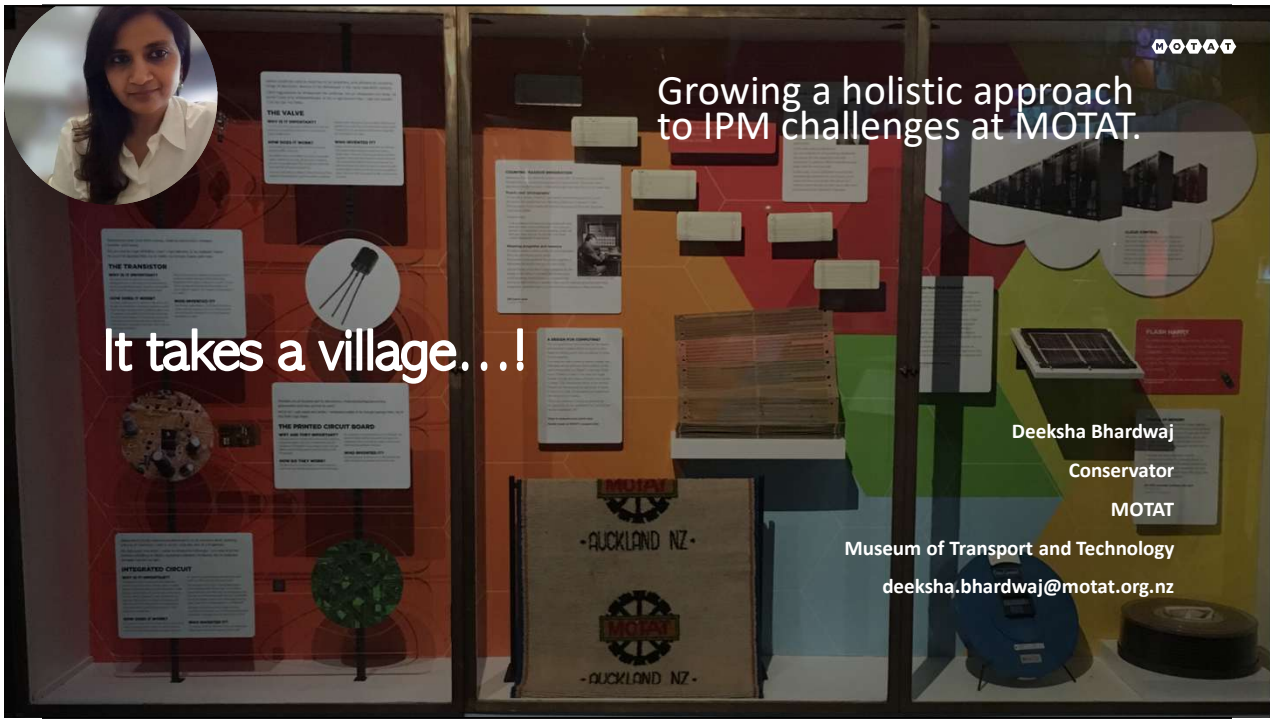


Tēnā koutou Katoa, Kia ora and hello everyone, greetings from NZ.
Ko Deeksha Bhardwaj Toku Ingoa, and I am one of the Conservators at Museum of Transport and Technology famously known as MOTAT which is based in Auckland, NZ.
This is my debut on Museum Pests and Pest Odyssey's public presentation forum. Attending last year's Pesty Business presentations was a big motivation for me to present and share something from MOTAT this time.
Today, I will share with you our risk assessment criteria for IPM which has been developed keeping in mind MOTAT's multiple sites, exhibition and collection spaces, diverse collection, seasonal pest related outbreaks, extreme weather event patterns affecting humidity and temperatures and mapping the pest traps data.
I will then also share how we have been navigating a holistic approach through teamwork and communication to mitigate these challenges to achieve the best outcome for our museum's environment, visitor experience and collections. That's what my title refers to 'It takes a Village' for an IPM program to be successful in a museum set up, as it requires involvement and support from everyone contributing towards keeping museum pest free.

MOTAT Main Museum- surrounded by Western springs lake, park and stadium .
MOTAT Aviation Hall Museum
MOTAT Offsite Storage

Offsite storage.

- A little introduction about MOTAT
MOTAT is made up of two museum sites. First one is Motat Main Museum and second one is Motat Aviation Hall Museum, both these museums are in close proximity to each other just under 2 kms apart and are also connected through a heritage tram ride as part of MOTAT Museum. The third site is offsite storage with some offices and a road transport workshop, which sits a bit further away.

- ❑ Unique collection
- ❑ Fully operational tram collection
- ❑ Invaluable volunteer contribution
- ❑ Part of a distinct landscape. Neighbors with Auckland Zoo, surrounded by Western Springs Park, lake side, TAPAC, stadium.

Western Springs park and lake side

Operational Vintage Trams

Historic 1877 Western Springs Pumping station

Aviation Hall Museum

A question often asked to me is,
What makes MOTAT so special,
To me,
It's the unique collection.
Motat Museum opened to the public in 1964. Since opening MOTAT collection has grown to over 300, 000 objects of technology, transport, science and social history from Aotearoa, NZ. Some of the collection highlights include operational aviation exhibits like the Lancaster Bomber and the Solent flying boat, vintage trams and rail vehicles (vee-uh-klz) operating on the Western Springs Tramway, the historic 1877 Western Springs Pumping Station demonstrating early industrial technology, and an impressive collection of firefighting equipment, including a unique right-hand drive, Mack Aerialscope. Many of our key Aviation, rail, small tech and telecom, restoration and maintenance projects are run with help from passionate volunteers. The expertise, specialist knowledge and years of experience that they incorporate into these projects is commendable.
We are very lucky to be part of a distinct landscape surrounded by some of the best loved local attractions and facilities like Auckland Zoo, lake side, western springs park and stadium and also The Auckland Performing Arts Centre.

How do we assess pest risks to collections housed in multiple buildings, exhibition spaces and storage areas?

- Dividing buildings into three categories

Controlled environment: Fully controlled environment due to large/bespoke HVAC systems and building structure. Suitable for long-term collection display and storage.

Semi-controlled environment: Possible to adjust environment with smaller aircon units and dehumidifiers, or by increasing airflow. Suitable for short to mid-term display and storage.

Uncontrolled environment: Open building structure, environment cannot be controlled, adjustments need to be considered. Restricted suitability for display or storage.

Let's talk about, how do we assess the pest infestation risks to collection housed in multiple buildings, exhibition spaces and storage areas?
There are certain parameters that we have used for risk assessment as part of our IPM Plan.
The first step was by dividing building in three categories.
As I mentioned, MOTAT has range of collection objects made of organic and inorganic materials. This is displayed and stored in MOTAT's buildings that have a selection of different designs and functions and are spread between three sites.
Different buildings have different abilities to maintain set temperatures and humidities. As a result, some buildings and collection are more prone to pest attack than others. It's an ongoing challenge to cater for collection care, for items that are more susceptible to biodeterioration.
To overcome this and monitor the environment and humidity more efficiently, MOTAT's buildings have been split into three different groups, and standards have been assigned in consideration of each group's abilities. We have managed to split these buildings in to
Controlled environment- Which is fully controlled, due to large/bespoke HVAC systems and building structure. This is suitable for long term collection display and storage.
Semi controlled environment – where it's possible to adjust environment with smaller air con units and dehumidifiers, or by increasing air flow. This is suitable for short to midterm display and storage.
Uncontrolled environment- means open building structure. Where environment cannot be controlled, adjustments need to be considered with restricted suitability for display or storage.

An example is some cottages at our historic village in the main museum have **Uncontrolled environment**. The collection housed in these cottages is at high risk of damage from pests and other agents of deterioration. These cottages obviously require more attention in terms of good housekeeping, regular inspection and strict environmental and pest monitoring as compared to Building 5, an example of **Controlled environment** and is currently running the **Te Pua wananga** exhibition and has been recently refurbished with HVAC systems in place.

- Type of collection and its susceptibility towards pest attack- archival objects, metal, wood, textile, a mix of metal, wood, textile, vinyl, e.g. a bus, tram or a car
- Location of the collection- controlled env/semi controlled/uncontrolled (dark spaces/back of the warehouse)

Chrysler Imperial Car 1928

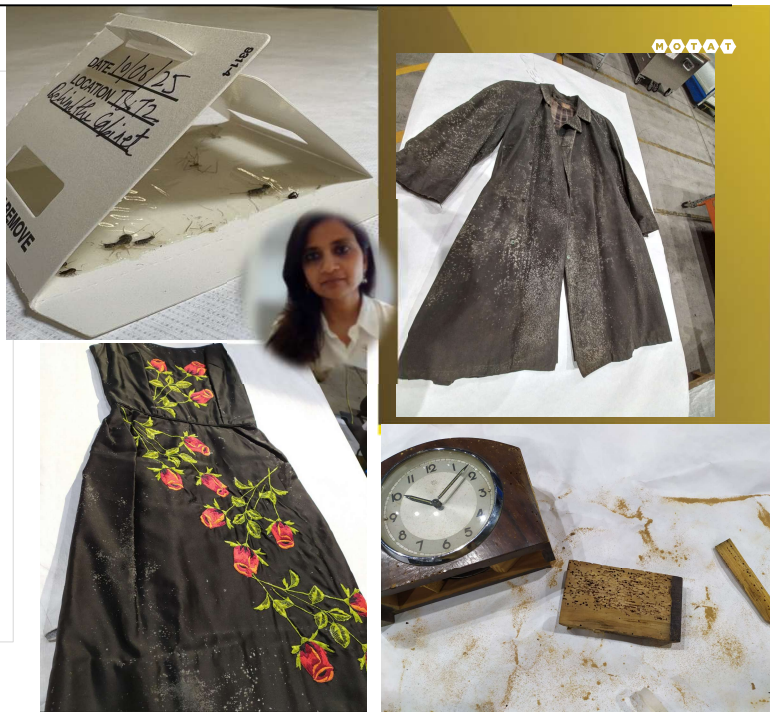
Automobile exhibition '*Accelerate*'

The second step was to identify the collection vulnerability for pest attack.
For example, any organic collection like, wood, archival, textile, painting, would always be more prone to attack from Borer, mould, silverfish etc, whereas inorganic collection is only immune if it does not have any organic microclimate in it. For example, the Chrysler Imperial car, which is stored at our offsite storage, although it has a metal exterior body, it also has wooden wheel spokes and wooden frame underneath with vinyl covered seats and some upholstery. At one point, it had borer infestation in wooden components, mould on upholstery and some metal corrosion. Had to be treated as a whole for different pest problems in it.

The third step was to identify the location of the vulnerable collectionE

CASE IN POINT- another building at Motat main museum that hosts an Auto mobile exhibition named '**Accelerate'** is also an example of **uncontrolled environment** space, where there is no HVAC and no humidity control. The objects on display are quite exposed to environment because of the lay out of the building, as a result, we get issues like birds flying in leaving their droppings on cars on display and we have also had had some visits from Possums and rats crawling on the beams in the roof of the space.

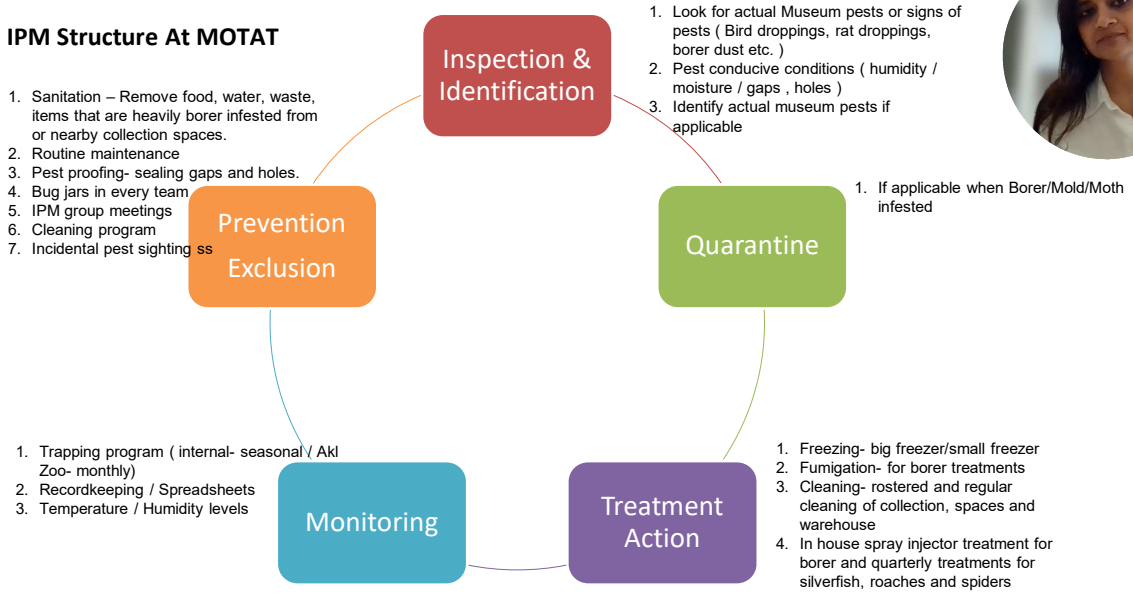
- Mapping the pest activity through pest trapping and regular inspections. By now, based upon years of trapping and monitoring we know the standard offenders causing damage to collection, Borer and mold holding the top positions.
- Mold outbreaks in extreme weather events and rainy seasons
- Relying on the information relayed from different teams working in different parts of the museum. For example, a Visitor Host reporting bird droppings on a car on exhibition display or a Conservation Technician on site reporting borer dust on a carriage or Registry team reporting mold on a textile while inventorying in one of the storage rooms.



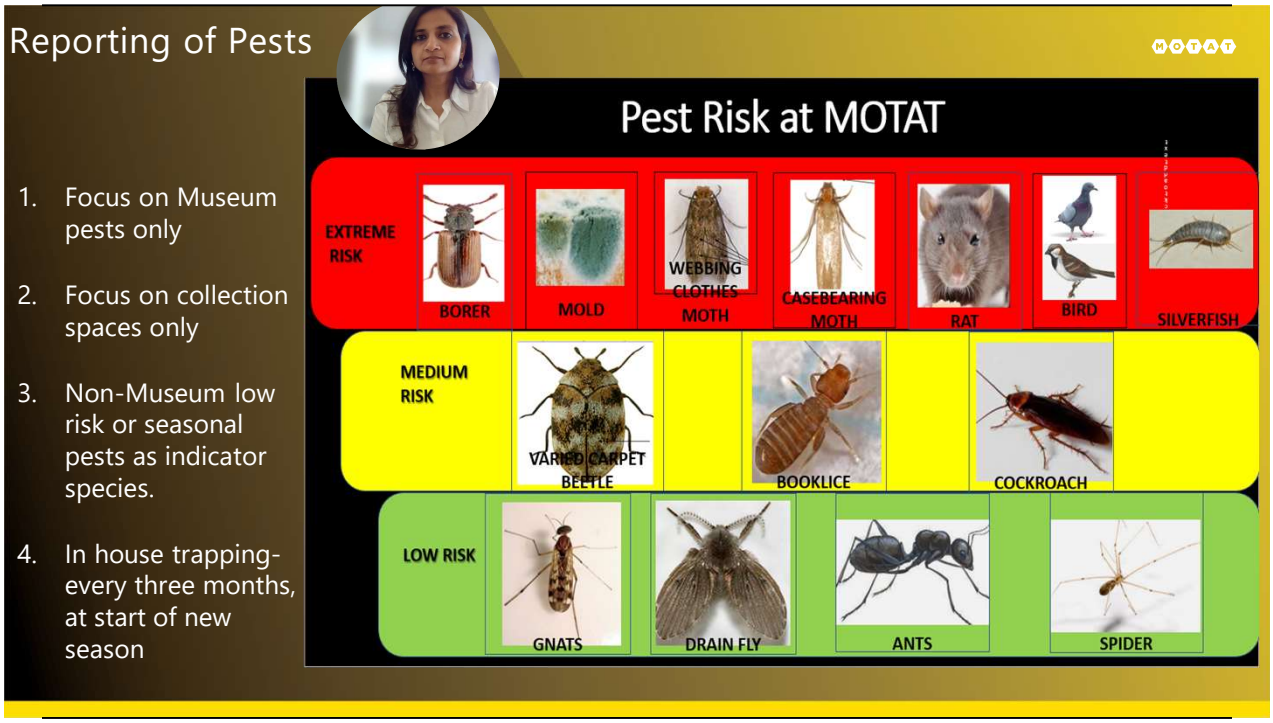
The other criteria that we have taken into consideration for risk assessment are,
Mapping the pest activity through our seasonal and monthly trapping and monitoring prog which confirms our top usual offenders responsible for damage being, borer and mould. Our trapping program has also given us information on general native insect diversity, seasonal insect visitors, detection of new insect pests, delimitation of area of infestation and for monitoring population levels of established pests. Further mapping of this data has helped us in making decisions on the initiation of control measures.

Extreme weather events in NZ particularly in 2022 and 2023 resulted in larger and severe mould outbreaks and ever since the affected collection in storage and display have been under strict monitoring.
Recording information that we receive from different teams stationed in different parts of the museum. Once we get notified of the damage or any sightings, we include and increase our monitoring for that collection and space.

Managing/mitigating IPM of different collections at MOTAT



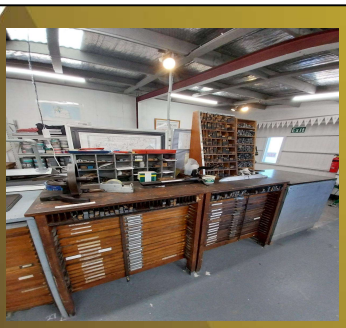
Using the data from above information as part of risk assessment, we have managed to customize our IPM plan and workflow to handle the pest infestation at MOTAT more comprehensively.
This IPM Structure and workflow is relevant to the needs of the different buildings and collections.
Although, the success of this workflow is highly dependent on teamwork.
Its holistic and encompasses different elements of IPM to achieve one common goal of improving the aesthetic, safety and longevity of collection and buildings.
Freezing is one of the biggest components of our IPM Treatments. We have one big size freezer for bigger items and one small chest freezer for smaller items. We have scheduled **freezer items cleaning day**s to clean and assess items that come out of freezer.
Our treatments also include seasonal spray treatments for silverfish, cock roaches and spiders around storage and collection spaces, fumigation and pinpoint spray treatments for borer infested items by external service provider which includes quarterly borer treatments for trams, carriages and a car.
For first two years, we adopted a somewhat aggressive approach to fumigate our trams and carriages, treating them every three months, as we had discovered a severe active borer infestation. Since then, we have noted a gradual improvement in these items and now for the past two years, we treat them every four to five months. They are now almost borer free.
We also have rostered in house cleaning programs at all three sites.
We also carry out in house minor spray injector treatment for borer, for small collection items as and when needed.
As part of prevention and exclusion,
We have an active and dedicated IPM group comprising of 15 reps from different teams across MOTAT.
We meet twice a year and discuss IPM program outcomes, current pest issues and infestations if any, more education sessions around how to differentiate between a museum pest, predator or indicator species, etc.
To document and report the museum pests captured in bug jars or any other incidental sighting of any pest around the museum, we have got Incidental Pest Sighting spreadsheet that lives in a shared folder for all MOTAT staff to use online. This is in addition to our regular pest trapping spreadsheet.



Because of limited resources, staff and time, we had to devise a plan that could effectively cover multiple sites, buildings and spaces with the best possible outcome for collection given the time constraints, considering we are only a team of six conservators and three of us being part time.
We have prepared tools like pest risk guide and pest glossary for all museum staff to use as a point of reference when looking for museum pests.
We managed to cut down on no. of traps, by focussing only on collection spaces and not common kitchen areas and toilets. However, these areas have been outsourced for monthly pest maintenance.
Focussing on Museum Pests only rather than on ants and spiders which are now only used as indicator species, indicating, plumbing problems, leaks, high humidity around drains, food sources or a thriving insect population, building issues like gaps and holes.
Our in-house trapping is done at the start of every season rather than every month. This takes us to four trapping cycles in a year which is quite manageable.
Outsourcing fumigation treatments to an external service provider for borer.
Outsourcing some internal and all external trapping to Auckland Zoo.
Empowering Motat staff with identification of museum pests, active reporting and good housekeeping.
As part of ongoing building refurbishments, we have decanted some collection from the uncontrolled environment buildings like historic cottages. This collection was assessed, treated, cleaned and now is part of long-term storage.

Treatments also customized based on location, object accessibility, type of pest infestation and collection type (collection item or non collection item

- Freezer facility only available at one site
- Big vehicles/objects cannot move so have to be treated in situ
- Items that are borer infested and have glass in them cannot undergo freezer treatment
- Treatment of non collection items
- Deaccessioning badly infested items.



Fully operational print shop

Borer infestation in a type cabinet

Since freezer facility is only available at one site, items that are found with borer, mould or any other active or inactive infestation at the other two sites, are either wrapped and brought to the freezer site depending upon the size of the object or at times, it's best to proceed with in situ borer treatments. Big vehicles like trams and buses are treated in situ. Also, items that have glass in them, which cannot go in freezer, are also chosen for in situ treatments.

The other big consideration for us as conservators is to understand the rationale for supporting and funding the borer or Mold treatments of non-collection items.

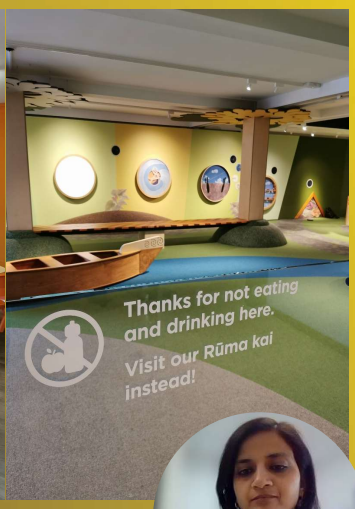
For example, we have an operational print shop which is run by volunteers over the weekends and on live days. Nearly all wooden type cabinets, which are operational non collection items in this shop were borer infested at one point.

In such scenarios, we help responsible/accountable teams through consulting and advising on best action plan which includes for them to liaise directly with the external service provider and pay from their own budget.

There are times when some items are so badly infested that they are either completely disintegrated or cannot be saved. Under such circumstances, we have to make a request for deaccessioning the item and dispose it off safely

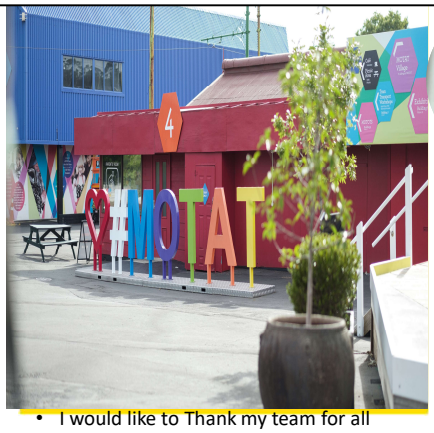
Key Takeaways

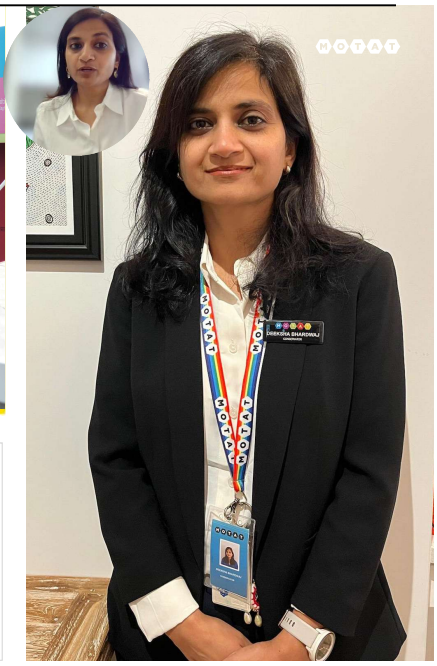
1. Use of online tools like Museum Pest Group and Ministry of Primary industries, NZ.
2. Teamwork and consistent Communication is the key to a successful IPM workflow.
2. Prevention through regular cleaning, inspection, good housekeeping will go a long way.
3. All museum staff must take ownership in aiming to keep museum pest free.
4. IPM awareness and evidence-based learning is an essential element of the program.



Kai Room in Building 5

Online tool like Museum pests' group is a big help for pest species identification, advice on pro and cons of different treatments, challenges being faced by different museums and Conservators.
We have also used MPI, NZ for cross verifying some native pest species.
I believe our program is holistic, realistic and quantifiable.
The use of chemical methods is very minimal and only used for borer treatments which is inevitable.
One of the biggest reasons behind efficient running and nearly successful implementation of IPM program at MOTAT by a small team, is the support of wider MOTAT team in understanding their role in safeguarding the collections.
Bugs and insects are part of our ecosystem, and no museum can ever be completely pest fee. However, the general rule of thumb is to minimise the use of chemicals, make museum environment unattractive for pests through prevention, exclusion, good housekeeping and early detection.
I strongly believe in attacking and fixing the source of the problem rather than treating it on the surface. Keeping that in mind, our focus is to set more achievable and sustainable goals, carry on with fine tuning and keep making little progress.





Thank You
Tēnā koutou

deeksha.bhardwaj@motat.org.nz

- I would like to Thank my team for all the encouragement, support and an amazing teamwork attitude!!
- I would also like to thank wider MOTAT teams and staff for playing their due role in making IPM program a success at MOTAT.
- Lastly, a big Thank You to Museum Pest group and Pest Odyssey for giving me the opportunity to represent MOTAT Museum from NZ and sharing our little IPM journey.

I would like to Thank my team for all the encouragement, support and an amazing teamwork attitude!!
I would also like to thank wider MOTAT teams and staff for playing their due role in making IPM program a success at MOTAT.
Lastly, a big Thank You to Museum Pest group and Pest Odyssey for giving me the opportunity to represent MOTAT Museum from NZ and sharing our little IPM journey.
Please feel free to contact me through e mail if you have any questions or feedback. Would be great to hear from you!