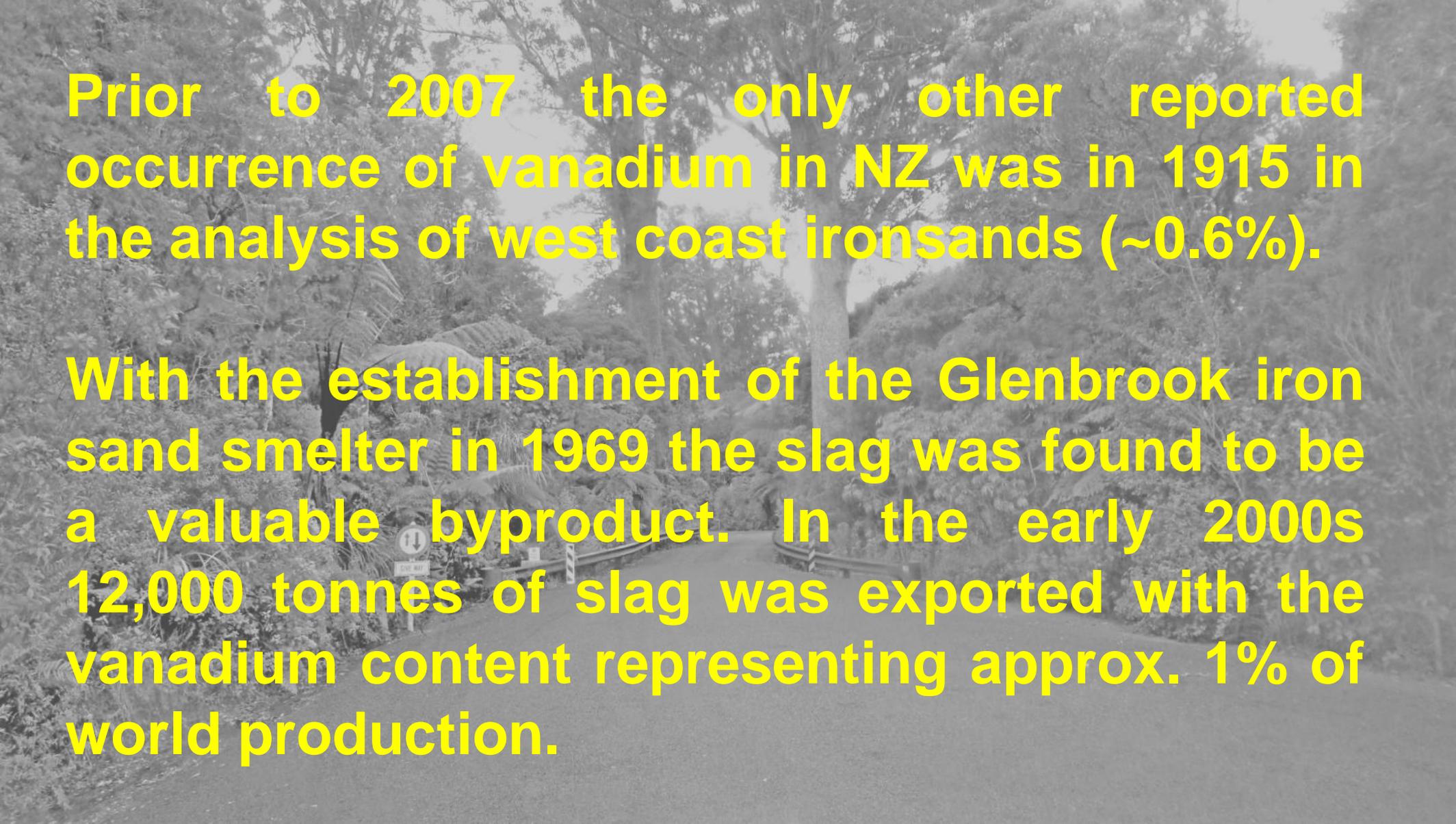


Vanadium in Aranga Quarry



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A grayscale background image of a winding road through a forest. The road curves to the right and is bordered by a guardrail. A road sign with a downward arrow and a 'ONE WAY' sign is visible on the left side of the road. The text is overlaid in bright yellow.

Prior to 2007 the only other reported occurrence of vanadium in NZ was in 1915 in the analysis of west coast ironsands (~0.6%).

With the establishment of the Glenbrook iron sand smelter in 1969 the slag was found to be a valuable byproduct. In the early 2000s 12,000 tonnes of slag was exported with the vanadium content representing approx. 1% of world production.

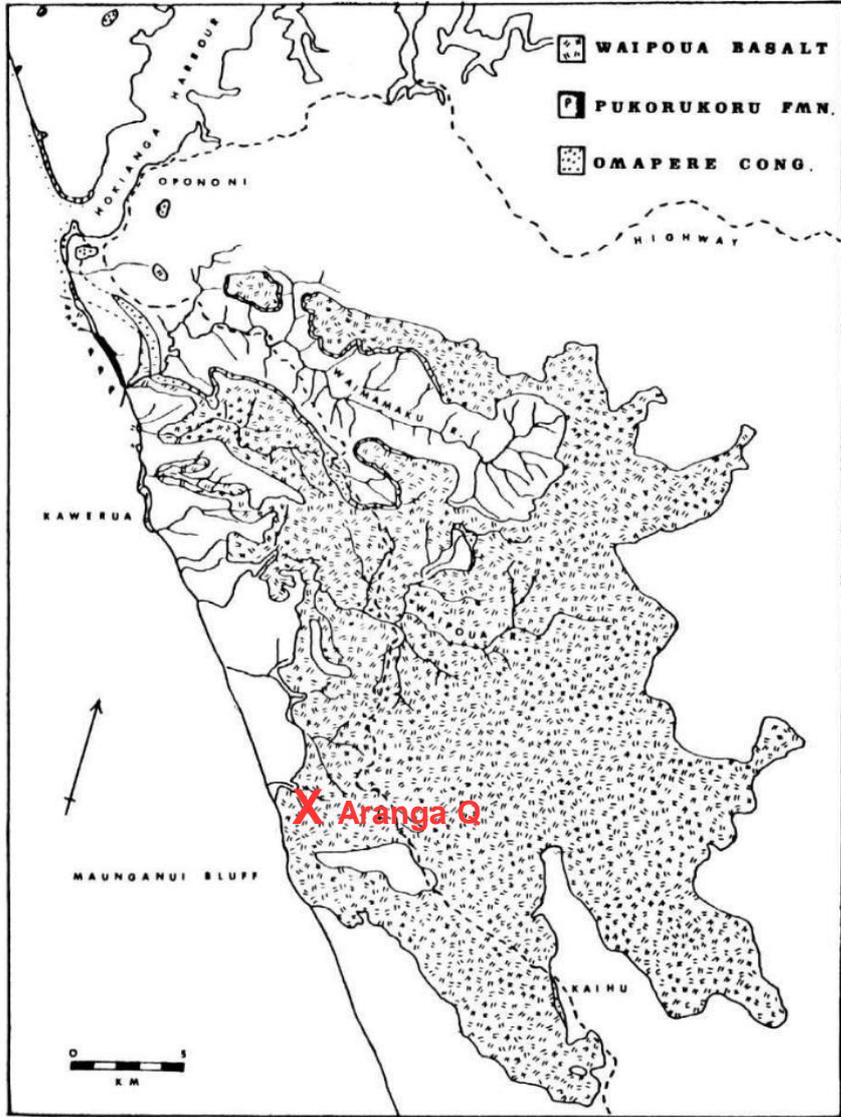
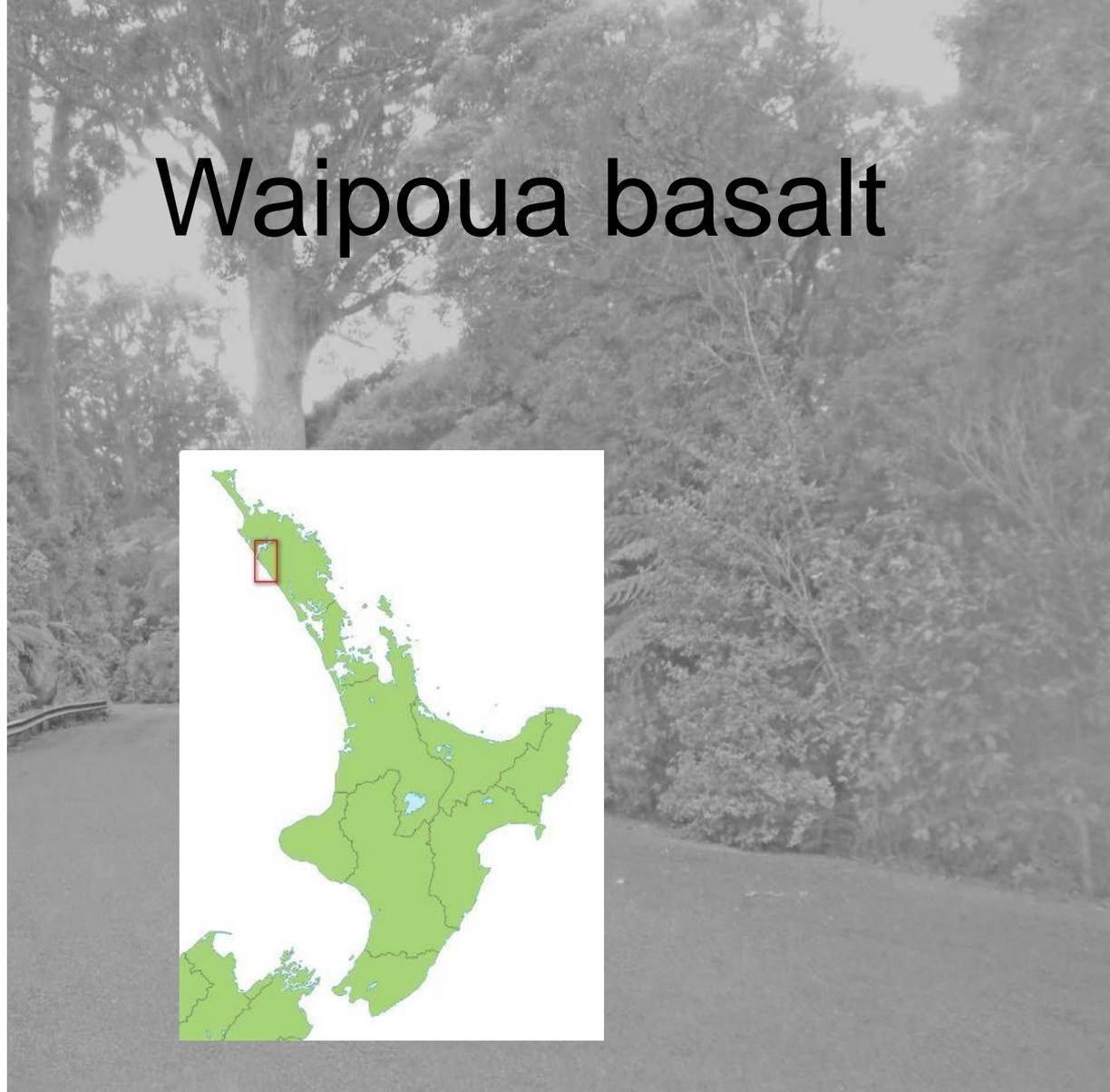


Fig. 5. Map of the Hokianga-Kaihu area showing outcrop of Waipoua Subgroup rocks. Compiled from Harrington⁵, Hay⁶, Hayward^{7,8}, MacFarlan⁹, Milligan¹¹, Thompson¹³ and Wakefield pers. comm.

Waipoua basalt



Waipoua basalt

Type locality is Hood Rd Quarry. Waipoua Basalt consists of an extensive sequence of (mid-Miocene) basalt flows with interbedded pyroclastics intruded by basalt dykes in many places. The flows conformably overlie Omapere Conglomerate or lie directly on Otaua Group sediments or older rocks with variable unconformity. The western half of the Waipoua Basalt sheet is tilted at about $2\frac{1}{2}^{\circ}$ to the west whereas the eastern half is more flat lying.

Hayward B.W., 1975, Waipoua basalt and the geology of Maunganui Bluff, Tane 21: 39-48.

Waipoua basalt

Chemical analyses..... (show) they are very similar to the pigeonitic series "tholeiitic" olivine basalts.

Having high Al_2O_3 , low TiO_2 , low $(FeO + Fe_2O_3)$ and low K_2O .

(No analyses are given for minor elements but they are expected to conform with Global averages for basalts at 250-300 ppm.)

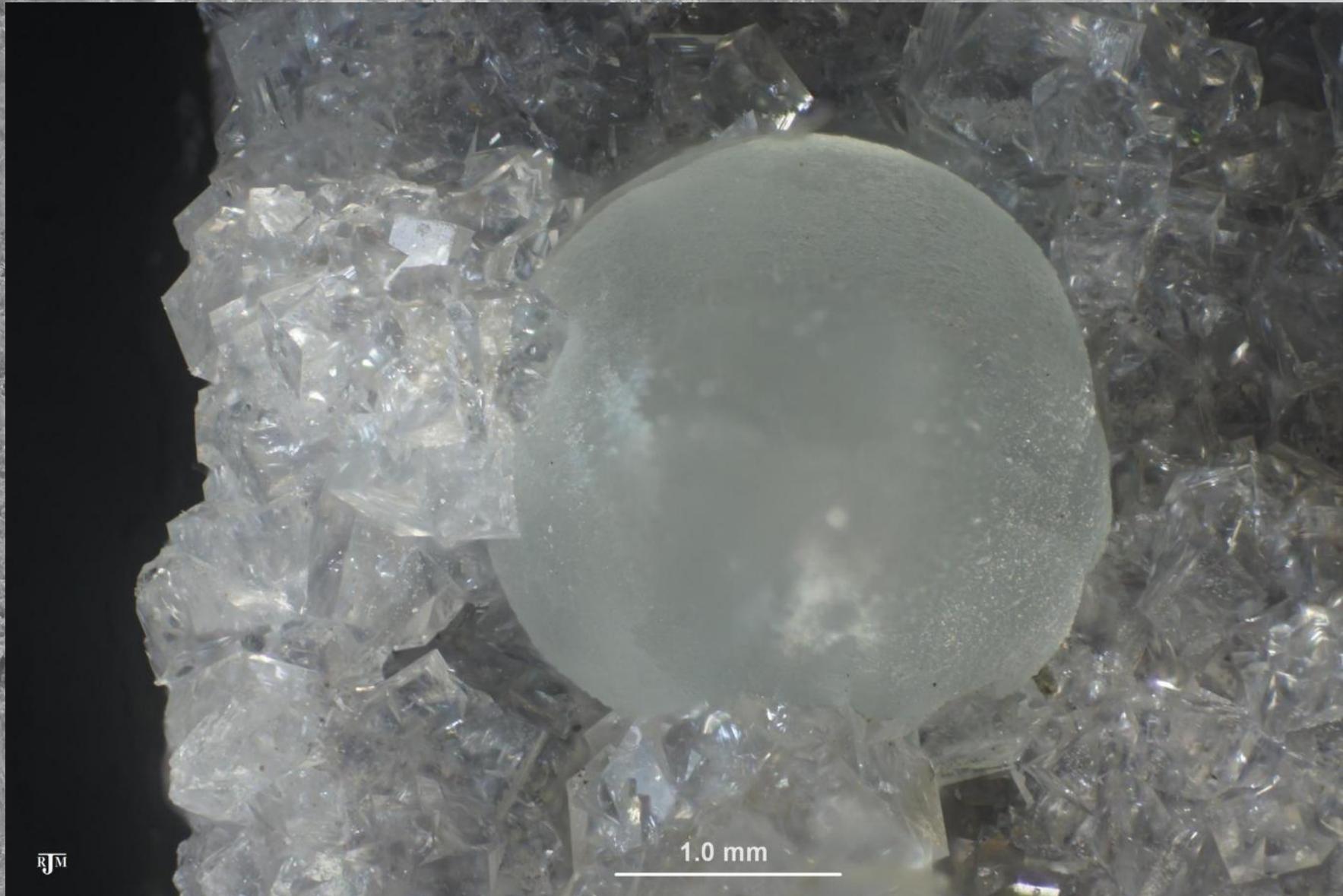
Hayward B.W., 1975, Waipoua basalt and the geology of Maunganui Bluff, Tane 21: 39-48.

Thomsonite-Ca

$\text{NaCa}_2[\text{Al}_5\text{Si}_5\text{O}_{20}] \cdot 6\text{H}_2\text{O}$

- Thomsonite-Ca was one of the earlier discoveries at Aranga but it was some time before the pale green globular form was found. In 2013 Judd presented details of her investigation of the colour source and found it was due to the minor presence of V (0.01-0.03 wgt %) and this was fully reported in AJM Vol 19/2

Graham, I.T., Judd, K., Colchester, D.M., Hager, S., Greig, A., Lay, A. (2018) The cause of colour in thomsonite-Ca from Aranga quarry, Northland, New Zealand. Australian Journal of Mineralogy, 19:2, 7-13.



RJM

1.0 mm

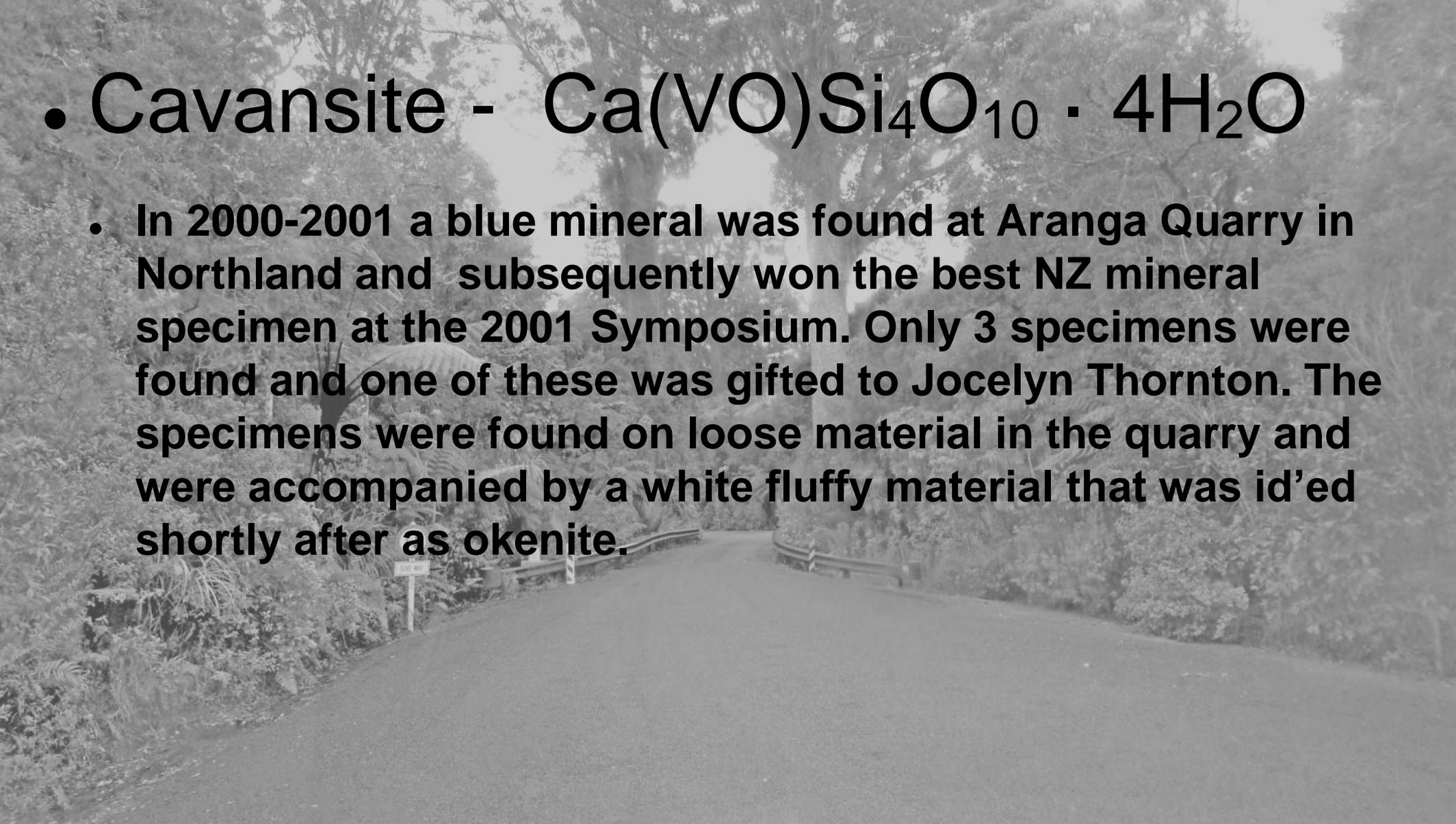


RJM

1.0 mm

Calcite with hemispheres of thomsonite along with fibrous and corraline forms.



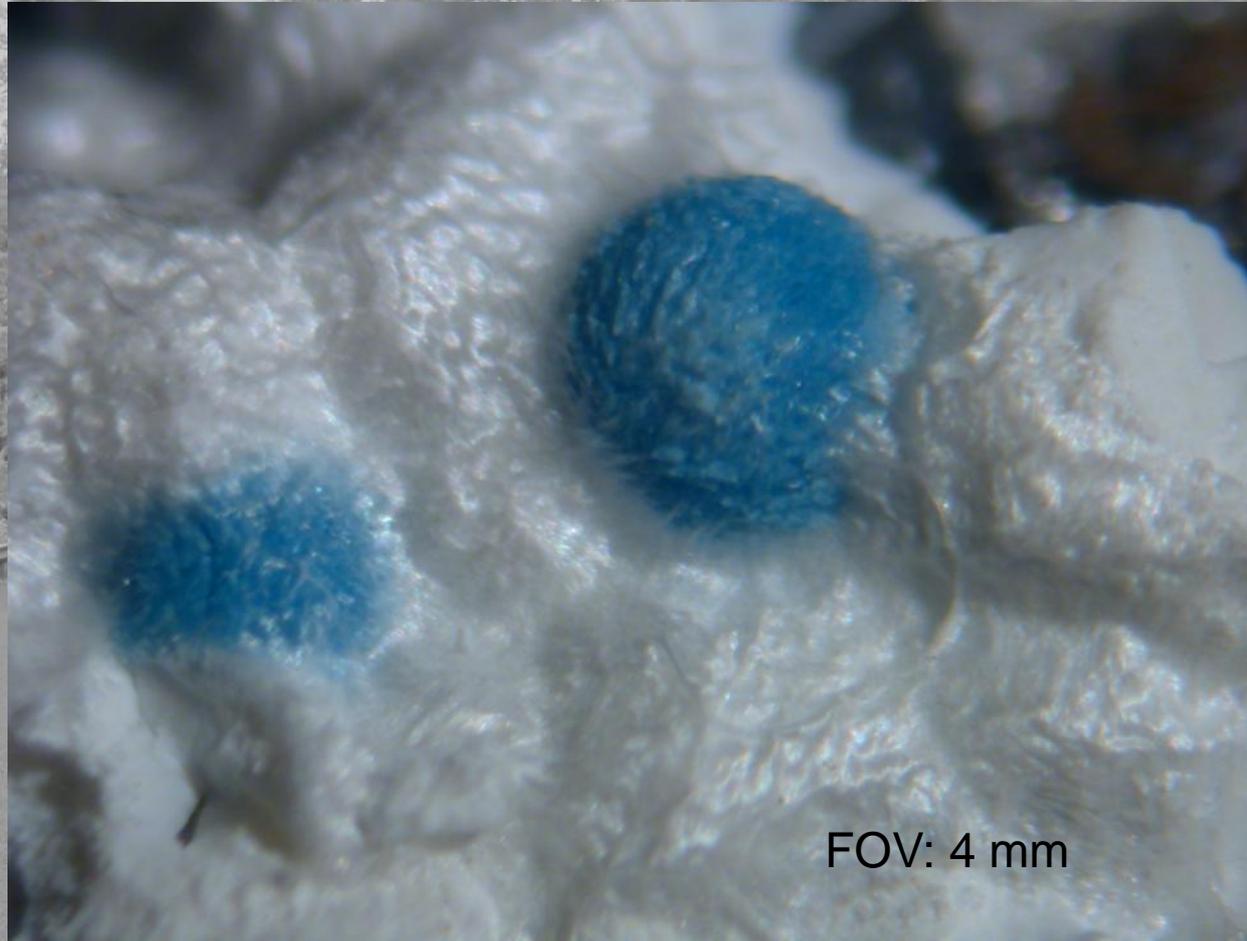


- **Cavansite - $\text{Ca}(\text{VO})\text{Si}_4\text{O}_{10} \cdot 4\text{H}_2\text{O}$**

- **In 2000-2001 a blue mineral was found at Aranga Quarry in Northland and subsequently won the best NZ mineral specimen at the 2001 Symposium. Only 3 specimens were found and one of these was gifted to Jocelyn Thornton. The specimens were found on loose material in the quarry and were accompanied by a white fluffy material that was id'ed shortly after as okenite.**

• Cavansite - $\text{Ca}(\text{VO})\text{Si}_4\text{O}_{10} \cdot 4\text{H}_2\text{O}$

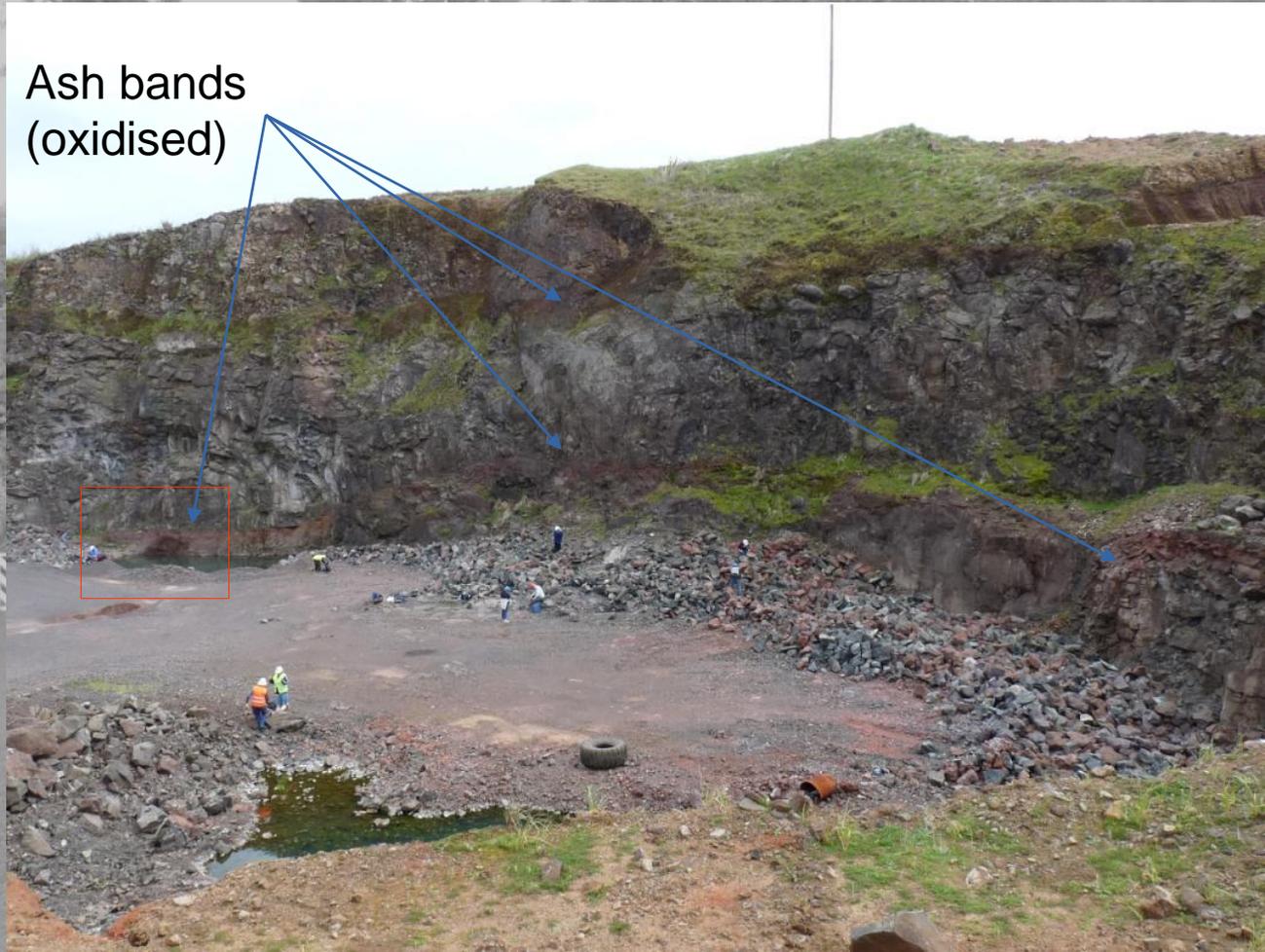
In 2003 Jocelyn loaned her “Blueey” to Tony Nikischer of Excaliber Corp. Who was able to use SEM-EDS to confirm the suspected cavansite id without damaging the specimen. A number more cavansites continued to appear over the next 5 years but still in very small numbers



In 2009 the NZ Symposium was held in Northland and the fieldtrip was up to Aranga. Both Jocelyn and Judy Rowe quickly found cavansites on the quarry floor and then many more were found. I managed to find a couple of large boulders that were studded with cavansites and these were broken up and distributed to all. The boulders were tracked to the recently blown quarry face (red square) and more were seen in the face but could not be retrieved as it was deemed too dangerous to approach

• Cavansite

Ash bands
(oxidised)



• Cavansite

Mineralised area



Focussing in on the interface

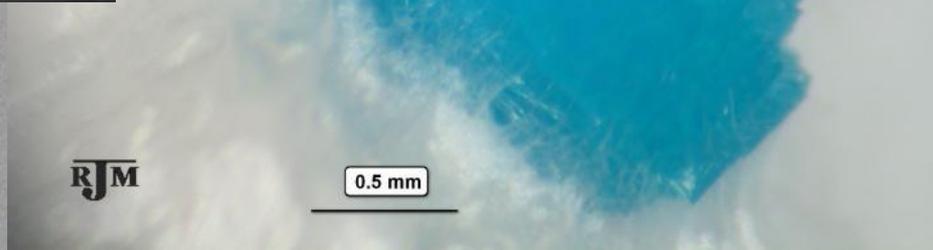
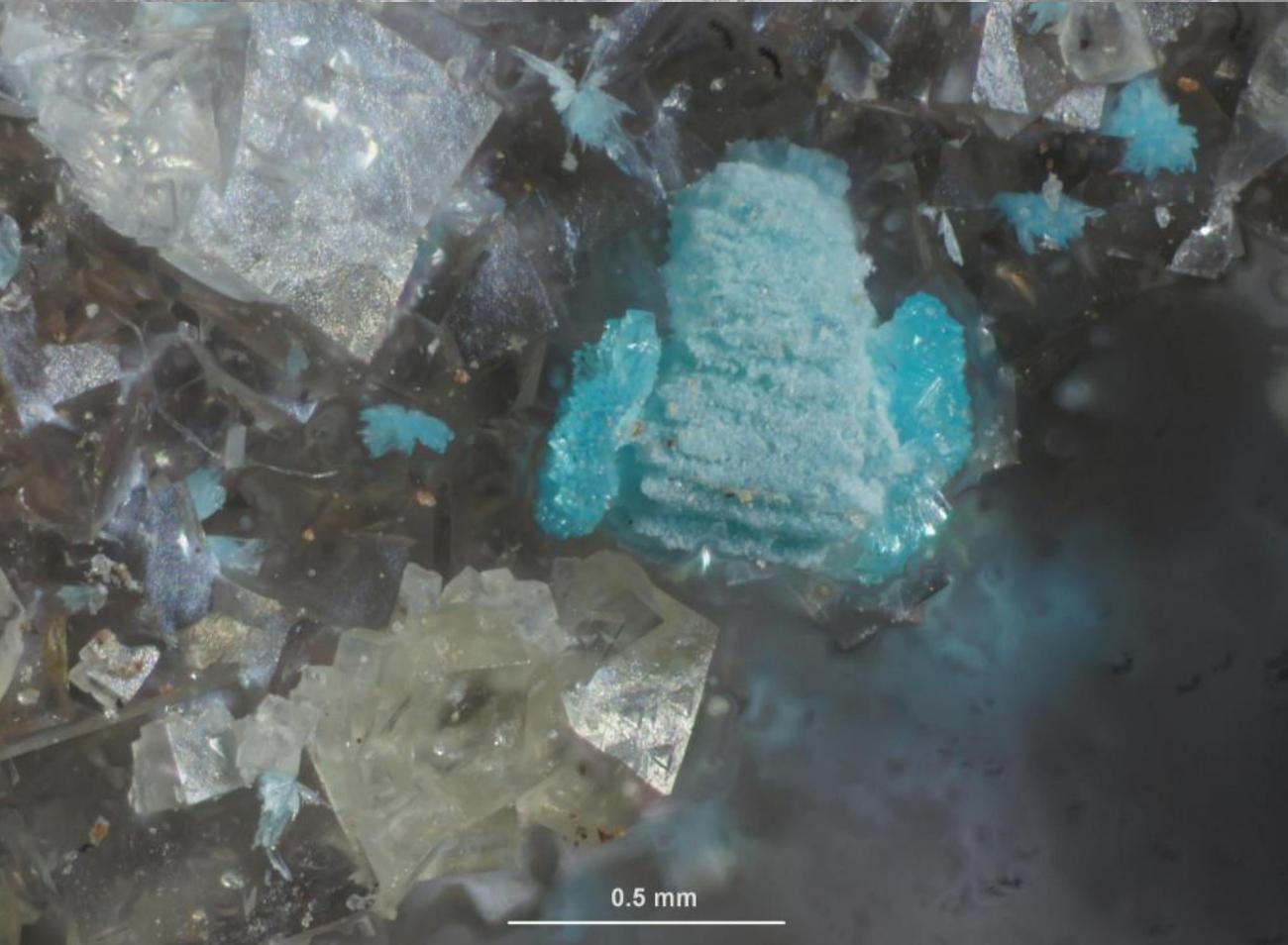
- **To the left is the red oxidised ash band**
- **To the right is the base of a grey basalt flow**
- **The base of the basalt flow shows minor brecciation possibly due to moisture in the ash band**
- **Voids in the brecciated areas are infilled with okenite, chabazite, thomsonite, calcite and cavansite**
-

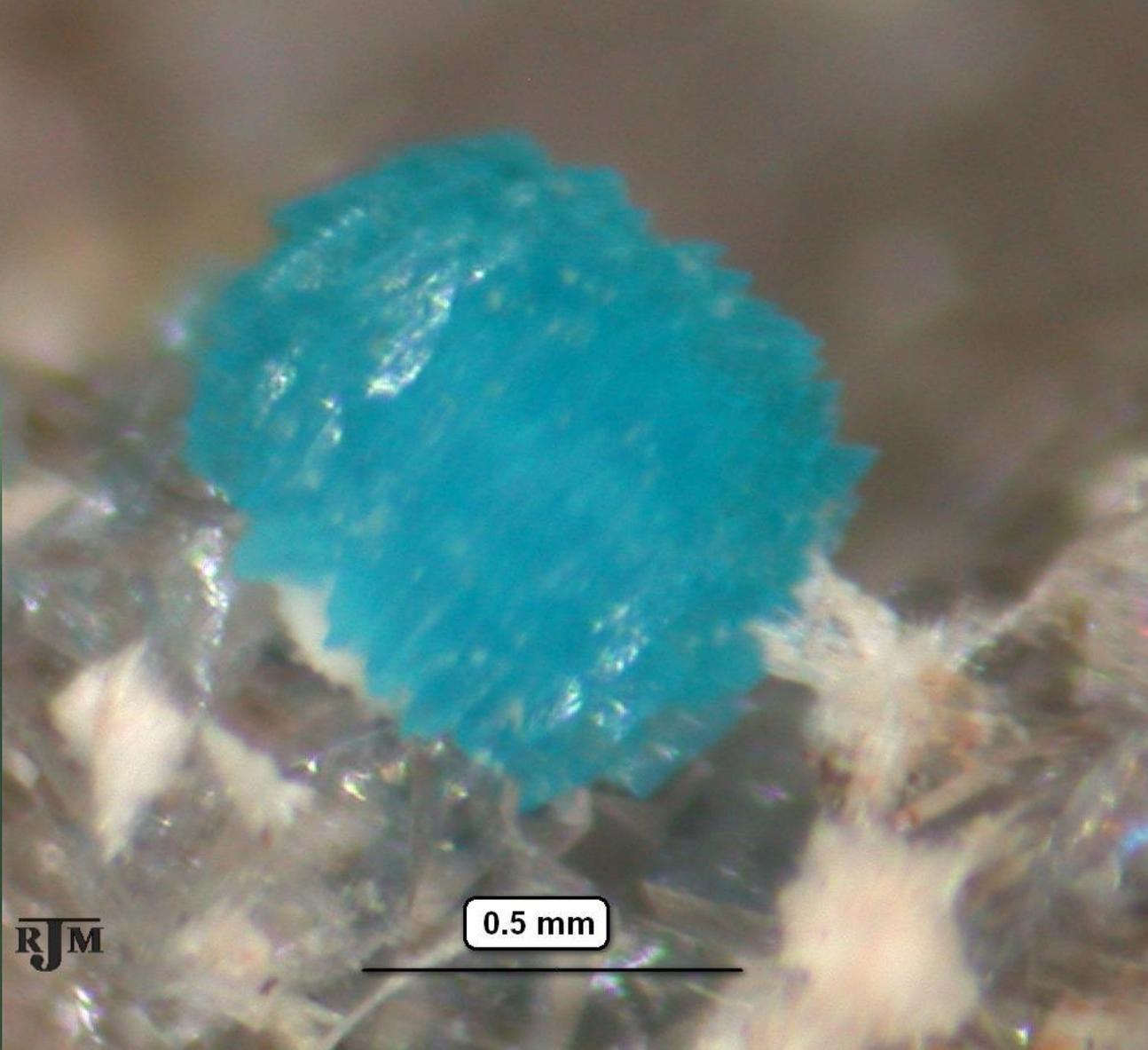
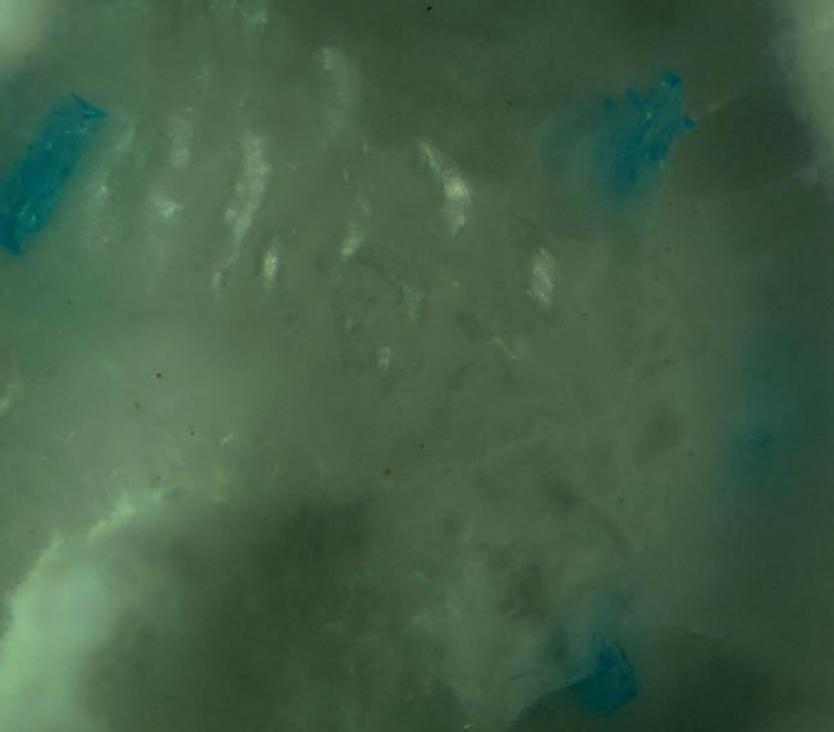




FOV: ~200 mm







RJM

0.5 mm

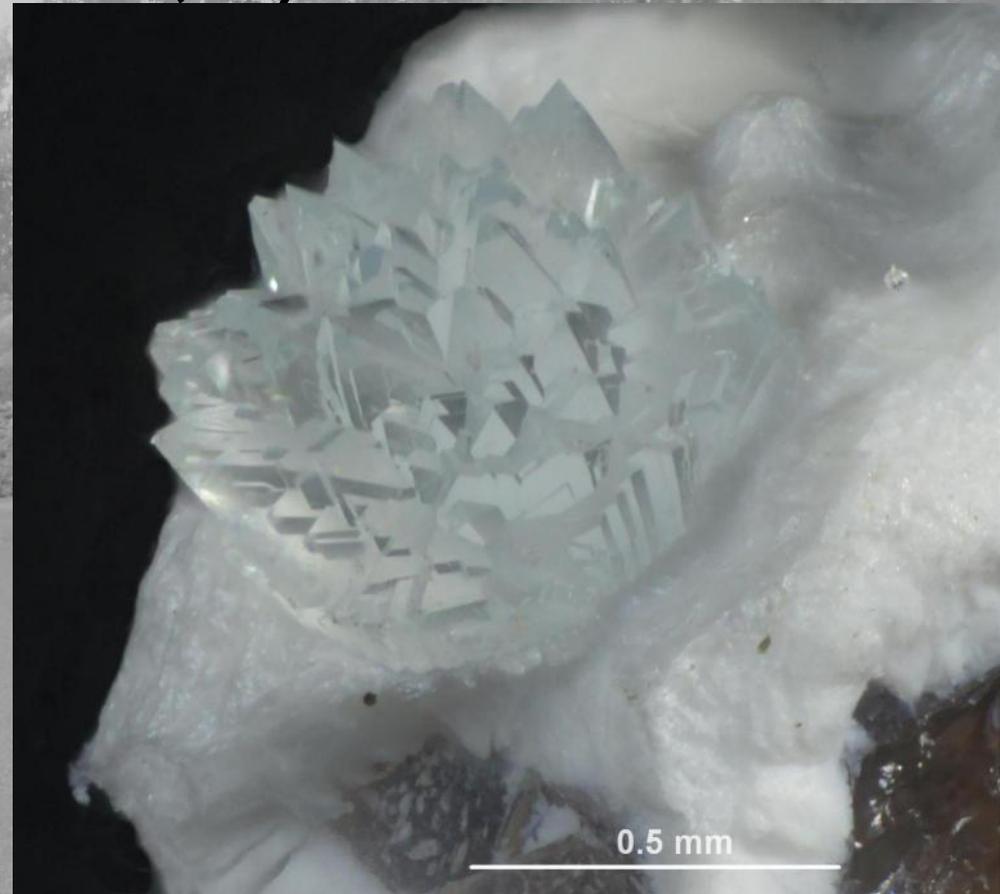
Hydroxyapophyllite-(K)

$$\text{KCa}_4(\text{Si}_8\text{O}_{20})(\text{OH},\text{F}) \cdot 8\text{H}_2\text{O}$$

Uncommon at Aranga, only 4 of which show the pale blue colour

VO^{2+} causes bright blue colour in a few minerals. In apophyllite from India, the colour is more green than blue.

http://minerals.gps.caltech.edu/COLOR_Causes/Metal_Ion/index.html



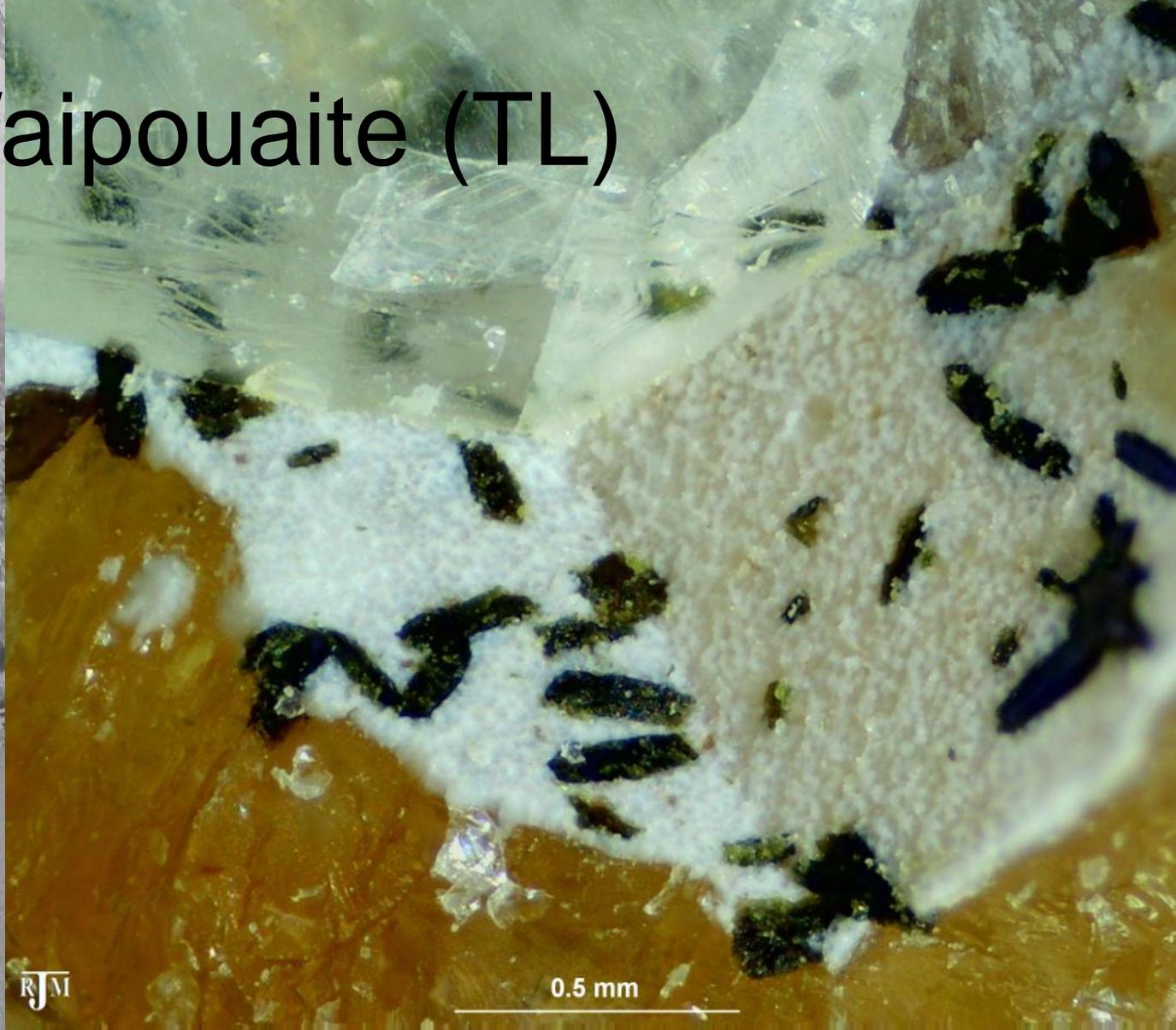
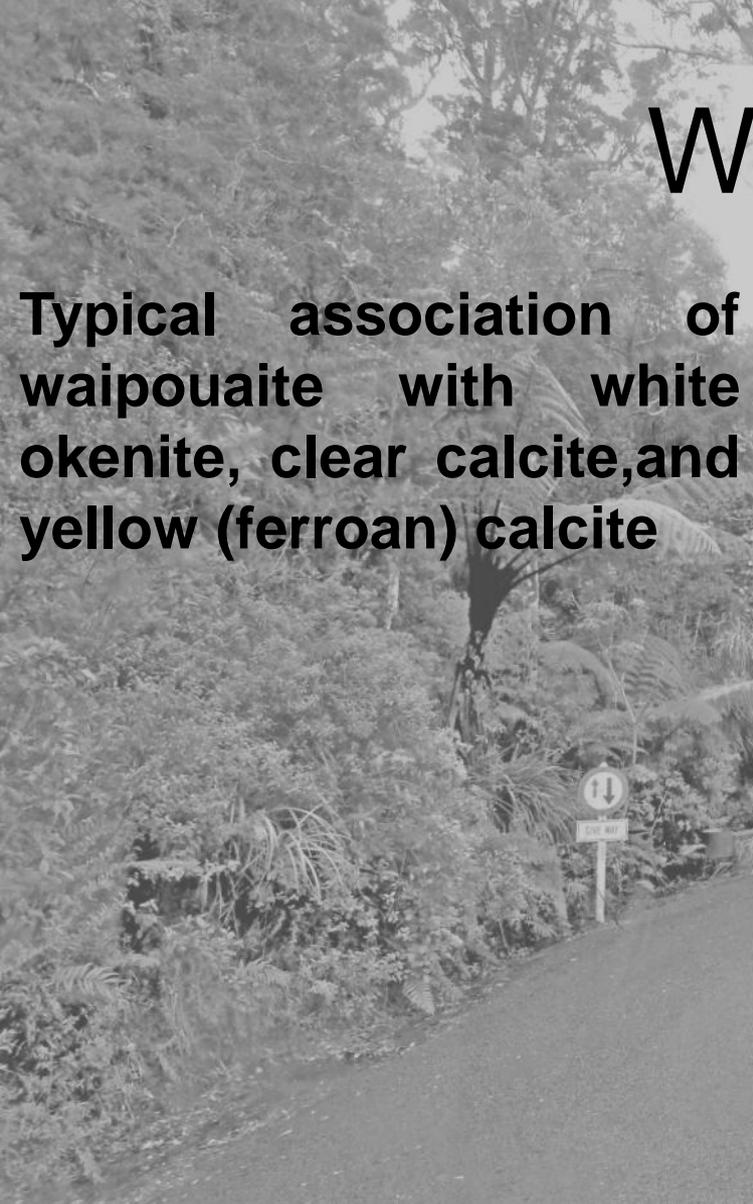
Waipouaite (TL)



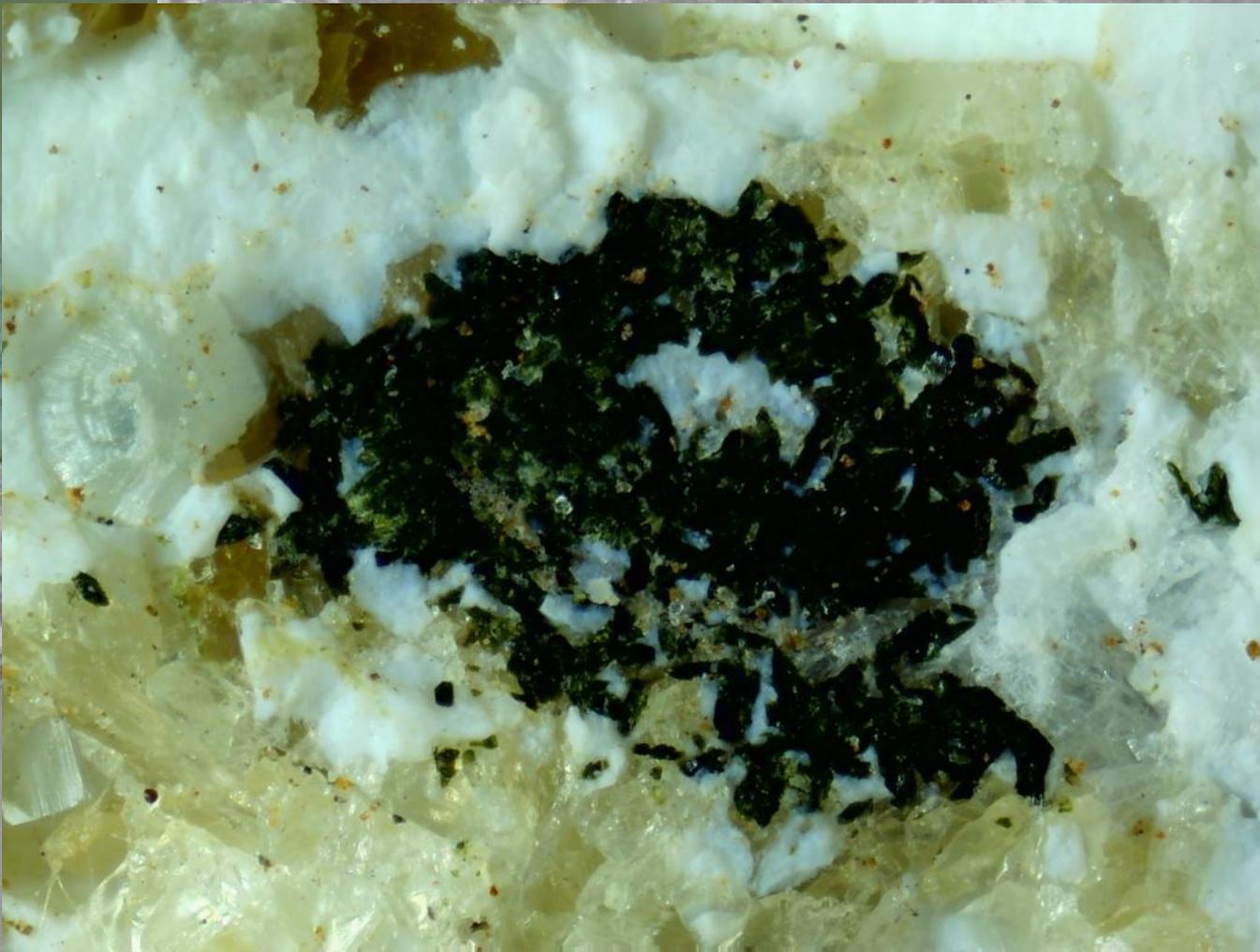
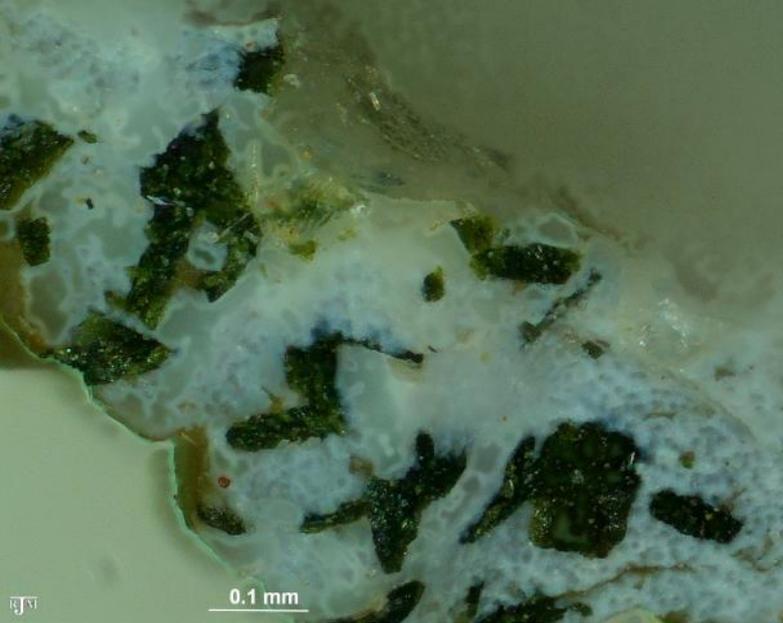
- First observed in 2017 in association with okenite and zeolites. Structure determined in 2019 and accepted by IMA, published in 2020.
- Monoclinic

Waipouaite (TL)

Typical association of waipouaite with white okenite, clear calcite, and yellow (ferroan) calcite

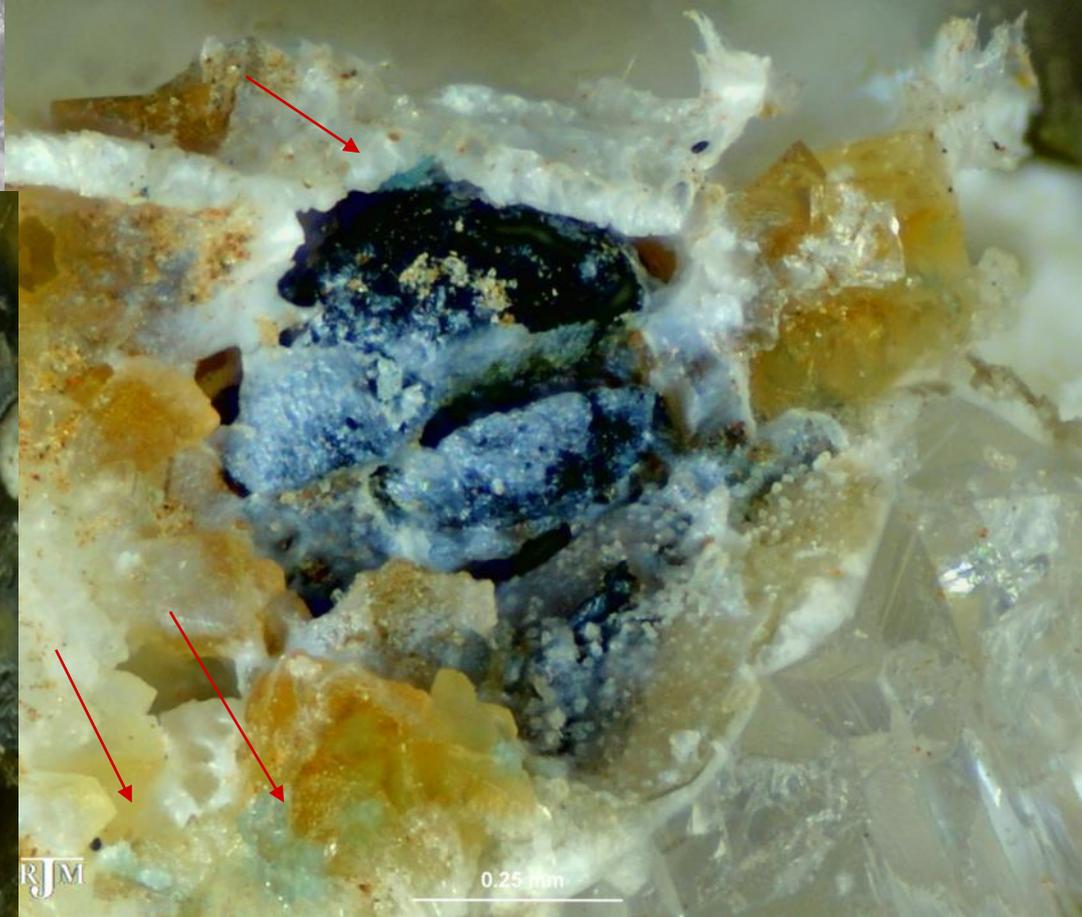








The image at right shows one of 3 specimens (found to date) with a globular form



One of only 2 specimens found that has both cavansite and waipouaite present

Paragenesis

**Chabazite → Calcite (\pm Fe) → Thomsonite → Waipouaite
→ Cavansite + Okenite → Thomsonite + Apophyllite**

Mineralising fluids

Alkaline → Carbonate → Alkaline → Oxidising → Alkaline

References

- Elliott, P., Kampf, A.R. (2020) Waipouaite, IMA 2019-095, in: CNMNC Newsletter 53. European Journal of Mineralogy: 32: 209–213.**
- Graham, I.T., Judd, K., Colchester, D.M., Hager, S., Greig, A., Lay, A. (2018) The cause of colour in thomsonite-Ca from Aranga quarry, Northland, New Zealand. Australian Journal of Mineralogy, 19:2, 7-13.**
- Hayward B.W., 1975, Waipoua basalt and the geology of Maunganui Bluff, Tane 21: 39-48.**
- Various authors, Essence of Micro-Scope**
- Wright, Anne C, 1980. Volcanic Geology of the Waipoua Area, Northland. NZJGG Vol 23, No 1.**

Thanks to

Mat Singleton

Carole Davies

Jocelyn Thornton

Various owners of Aranga Quarry

Members of NZ Micro-Mineral group

Overseas guests

**Note: All mineral images are posted on Mindat.org
where more detail is available on the specimens.**