The Gertrud Theiler Tick Museum

The Parasites, Vectors & Vector-borne Diseases Programme (PVVD) of the ARC - Onderstepoort Veterinary Institute (ARC-OVI), is the proud custodian of the Gertrud Theiler Tick Museum (incorporating the National Tick Collection) recognized as a national public goods asset. The museum was established in 2005, after incorporating collections of the African Tick Museum housed previously at the Midrand University, Gauteng (through the patronage of Dr A. Latif) with those of the Onderstepoort Tick Collection. The collection currently houses some 2 500 tick collections, comprising 375 species from 19 genera of all three ixodid families, rendering it of great historical and archival value. In a biosystematics context, the collection houses 54 type specimens of South African and foreign tick species and a recently instituted DNA bank (currently consisting of 42 tick species sequenced by ARC-OVI staff and the University of Stellenbosch), which renders the collection as a resource of invaluable worldwide significance to tick taxonomy and diversity. As a repository collection that may be exploited for taxonomic, ecological and bio geographical research, it holds priceless intellectual property (IP) value and serves also as a vital asset in subject specific training.

The Museum is named in honour of Dr Gertrud Theiler for her tireless dedication to tick taxonomy in South Africa.

Logo & Current Curator (Heloise Heyne - Profile)

The tick species *Cosmiomma hippopotamensis* was chosen for the logo as this species became extinct in South Africa (Brits – Pretoria – Rustenburg area) when its natural host, the rhinoceros was hunted out.

The Gertrud Theiler Tick Museum strives to fulfil its diverse functions as a reference centre, repository, research and training resource.

The Museum strives to provide a functional facility for tick phylogenetic, classical taxonomy and epidemiological studies relevant to tick control and biology.

Objectives & Activities

1. **Tick identification inclusive of survey, *ad hoc* and routine diagnostic specimens**
2. **Maintenance, upkeep and database of the tick collection.**
3. **Repository for tick specimens of taxonomic value and in training as well as a DNA bank for molecular studies.**
4. **Storage and dissemination of taxonomic literature/references**
5. **IP exploitation for research purposes**
6. **Imaging of relevant specimens**
7. **Tick taxonomy training and general technology transfer on livestock pests and diseases**

HISTORY

The National Tick Collection was started by G A H Bedford (Entomologist) in 1912 with *Aponomma exorn*atum nymphs collected from a water leguaan (*Varanus niloticus*) in the Onderstepoort locality, incorporating Charles Lounsbury's, the American entomologist who worked in the Cape Colony. From 1939 to 1967 the collection was largely extended by Gertrud Theiler (1939-1980's) During the previous century various other tick workers have also contributed toward the collection: J B Walker (1966 – 2000's), M B Baker, J D Bezuidenhout, A M Spickett, I G Horak, A Latif, H Heyne (current curator) & I McKay to name but a few.

GAH Bedford & The Historical Collection

THE COLLECTION

The Museum contains some 2500 collections, mainly from South Africa, but as far afield as Vietnam. It is the largest tick collection in Africa. Nearly all known tick genera; comprising 375 species from 19 genera with 54 type specimens, consisting of holotypes, allotypes and paratypes, are represented in the Museum. Almost the entire genera of *Rhipicephalus* and *Hyalomma* of the world are contained in this collection, with 74 species out of the recorded 87 and 24 out of 30 respectively.

It also contains the world's rare species; *Nosomma monstrosum, Cosmiomma hippopotamensis*, all species in the genera *Margaropus* and *Rhipicentor*, and the so-called "missing link" *Nuttalliella namaqua*, *inter alia* the only known male specimen of *N. namaqua.*

A Holotype Collection for DNA sequencing is also maintained. A duplicate collection of ticks comprising 76 species from Africa & South America sent to various scientists for DNA sequencing is kept in the museum.

COLLABORATION

Various acarologists world-wide have exchanged tick specimens and numerous species have been added to the Tick Collection. Amongst the world-renowned tick taxonomists that contributed are Kolonin from Russia, Tenderoi from Portuguese Africa, Hoogstraal from the USA Navy Laboratories in Cairo, Estrada-Peña from Spain and Frans Jongejan from Utrecht.

Over the years a number of foreign scientists have also re-identified some of the problematic ticks: Rupert Pegram, Harry Hoogstraal, C. M. Clifford, Rocky Mountain Laboratory (Jim Keirans), Don Arthur and recently Dimitry Apanaskevich who re-identified the *Hyalomma* collections.

Imaging of tick specimens

KEY PUBLICATIONS

APANASKEVICH DA & HORAK IG, 2008. The genus *Hyalomma* Koch, 1844. III. Redescription of the adults and larva of *H.* (*Euhyalomma*) *impressum* Koch, 1844 (Acari: Ixodidae) with a first description of its nymph and notes on its biology. *Folia Parasitologica* 54:51-58

APANASKEVICH DA & HORAK IG, 2008. The genus *Hyalomma*. VI. Systematics of *H.* (*Euhyalomma*) *truncatum* and its closely related species *H.* (*E.*) *albiparmatum* and *H.* (*E.*) *nitidum* (Acari: Ixodidae). *Experimental and Applied Acarology*, 44:115-136

HÄNEL C & HEYNE H, 2008. Ticks of the Tristan da Cunha Archipelago (Acarina: Ixodidae: Argasidae). *Beiträge zur Entomologie* 58: 121 – 134

HORAK IG, HEYNE H & DONKIN EF. 2010. Parasites of domestic and wild animals in South Africa. XLVIII. Ticks (Acari: Ixodidae) infesting domestic cats and wild felids in southern Africa. *Onderstepoort Journal of Veterinary Research* 77(1), Art#3, 7 pages. DOI: 10.4102/ojvr.v77i1.3

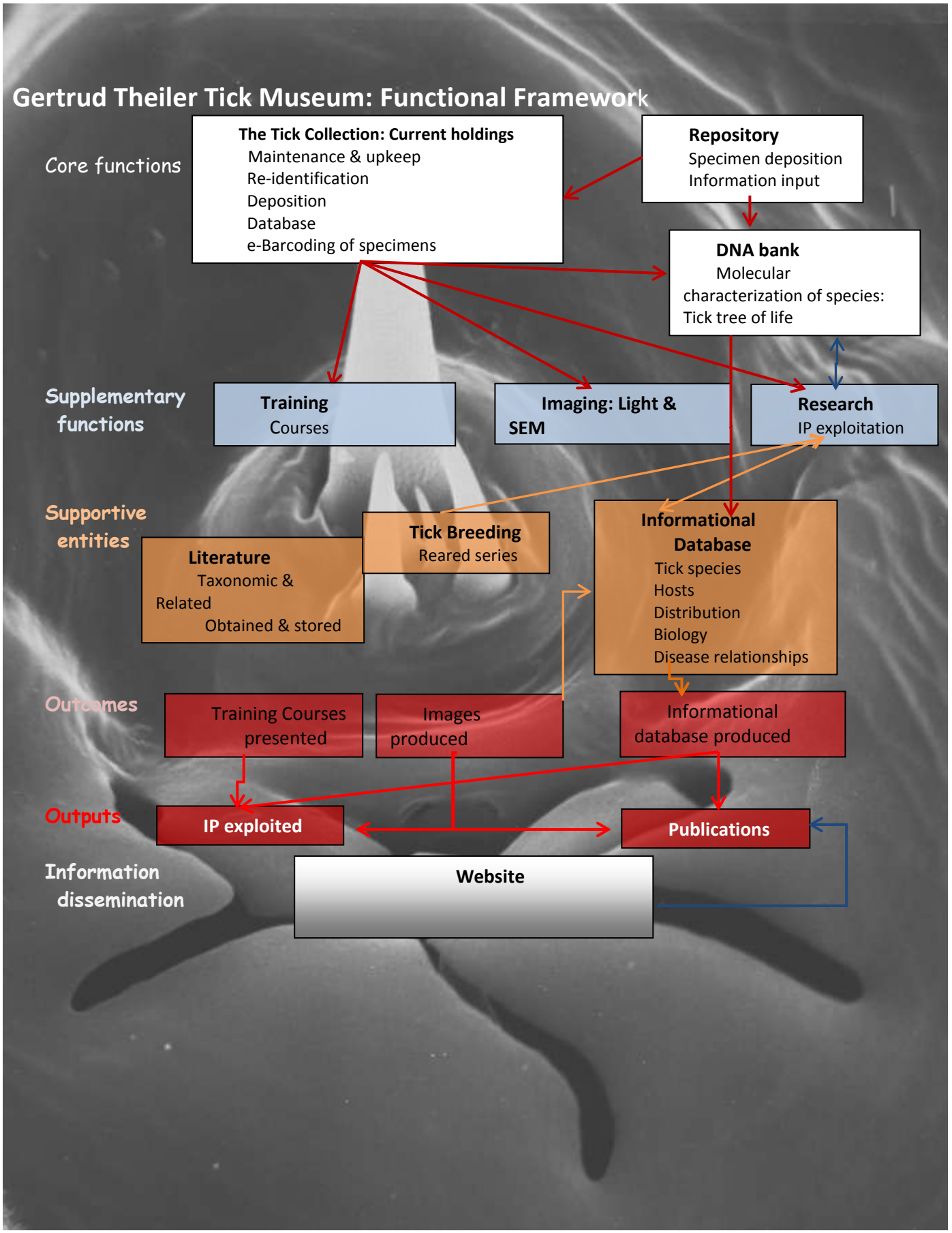
HORAK IG, MCKAY IJ, HENEN BT, HEYNE H, HOFMEYR MD & DE VILLIERS AL, 2006. Parasites of domestic and wild animals in South Africa. XLVII. Ticks of tortoises and other reptiles. *Onderstepoort Journal of Veterinary Research* 73(3): 215-217

HORAK IG, MCKAY IJ, HEYNE H & SPICKETT AM, 2006. Host, seasonality and geographic distribution of the South African tortoise tick, *Amblyomma marmoreum*. *Onderstepoort Journal of Veterinary Research* 74: 13-25

LATIF AA, PUTTERILL JF, DE KLERK DG, PIENAAR R & MANS BJ. 2012. *Nuttalliella namaqua* (Ixodoidea: Nuttalliellidae): First Description of the Male, Immature Stages and Re-Description of the Female. PLoS One 7: e41651.

MANS BJ, de KLERK D, PIENAAR & R, LATIF AA (2011) *Nuttalliella namaqua*: A Living Fossil and Closest Relative to the Ancestral Tick Lineage: Implications for the Evolution of Blood-Feeding in Ticks. PLoS ONE 6 (8): e23675. doi:10.1371/journal.pone.0023675.

SPICKETT, AM, HEYNE, H & WILLIAMS, R, 2011, 'Survey of the livestock ticks of the North West province, South Africa', *Onderstepoort Journal of Veterinary Research* 78(1), Art#305, 12 pages. DOI:10.4102/ojvr.v78i1.305


Gertrud Theiler Tick Museum: Functional Framework
Core functions
The Tick Collection: Current holdings
Maintenance & upkeep
Re-identification
Deposition
Database
e-Barcoding of specimens
Repository
Specimen deposition
Information input
DNA bank
Molecular characterization of species:
Tick tree of life
Supplementary functions
Training
Courses
Imaging: Light & SEM
Research
IP exploitation
Supportive entities
Literature
Taxonomic & Related
Obtained & stored
Tick Breeding
Reared series
Informational Database
Tick species
Hosts
Distribution
Biology
Disease relationships
Outcomes
Training Courses presented
Images produced
Informational database produced
Outputs
IP exploited
Publications
Information dissemination
Website