AU-IBAR

Mapping of Diseases and pests of honey bees in Africa

6th ApiExpo Africa International Conference

Abuja-Nigeria

Dr P.M Ithondeka PhD MBS

26th September 2018

www.au-ibar.org

Importance of bees

"If the bee disappeared off the surface of the globe then man would only have four years of life left. No more bees, no more pollination, no more plants, no more animals, no more man." **Albert Einstein**

- The annual cost to the Egyptian economy of losing its pollinators would be approximately ($2.4 billion), 3.3% of the 2003 GDP (Brading et al 2009)

- An early estimate for the value of pollination services was 0.4% of GDP for the whole world (Costanza *et al. 1997);*

Species and importance of honeybees in Africa

- There are thousands of different species of bees in the world,
- The most important for beekeeping in Africa are the western honey bee, *Apis mellifera* with their *subspecies.*
- *Apis mellifera* has been farmed in Africa in the last 8000 to 10000 years ago
- Honey from bees was used in ancient Egypt for sweetening cakes and embalming
- Used also in Africa for preservation of food and meat.
- Most of African cultures require honey for marriage ceremonies

AU-IBAR

what' and 'where' and 'so what' Bee Diseases & Bee Pests

- Need to know 'what' and 'where' and 'so what' of any bee pests or disease – before can properly assess the risk – and before can address what management is needed

- So, how much do we know about the What and the Where and the So What of bee pests and diseases in Africa?

AU-IBAR

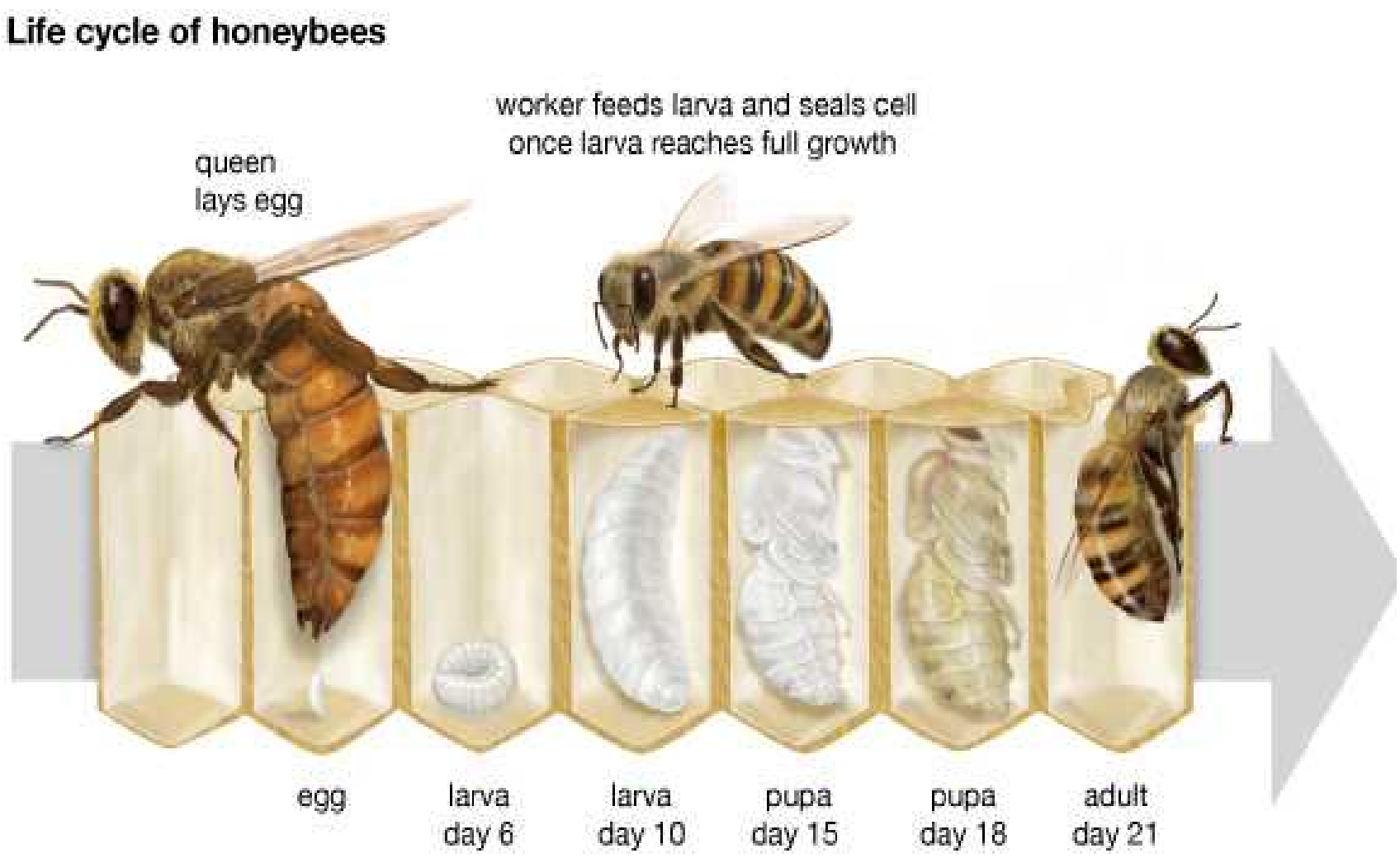
Intensive versus extensive in relation to bee health

- Intensive beekeeping commonly practised with *Apis mellifera* in focus is at the level of the honey bee colony.
- extensive beekeeping, focus is not at the colony level, but rather on the local population of honey bee colonies.
- In extensive the populations of honey bees remain apparently intact and healthy as

  1) the bees and their pathogens are living and evolving in a natural way;

  2) the bees select their own nesting sites and food sources; because the bees build their nest naturally and undisturbed by humans (until harvest)

Bee diseases /pests transmission at various stages of metamorphosis along the value chain



Understanding the life cycle of the Varroa mite

1

The queen is the largest in the beehive. She lays up to 2,000 eggs per day in the brood cells.

2

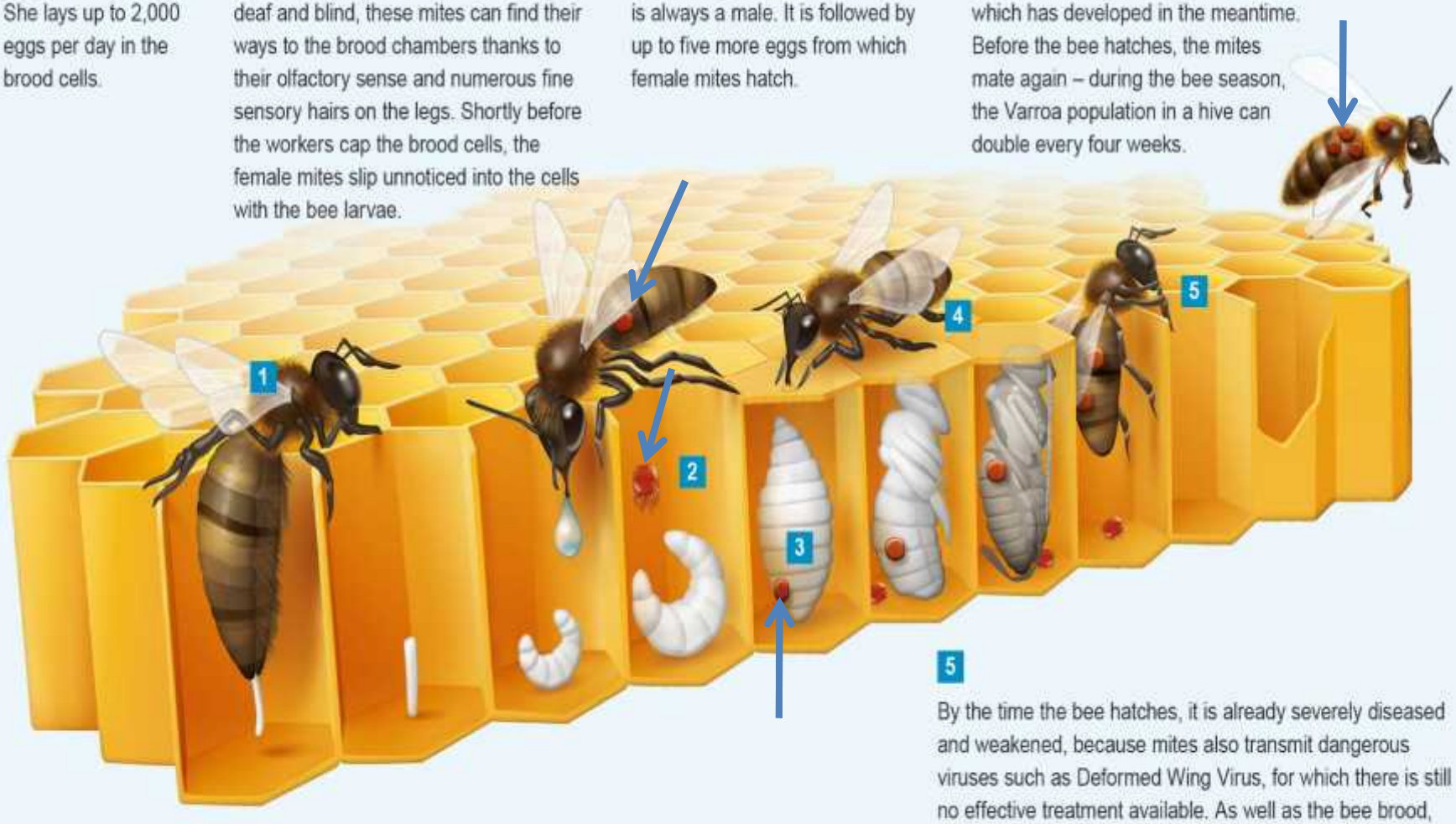
Worker bees often carry Varroa mites with them into the hive. Despite being deaf and blind, these mites can find their ways to the brood chambers thanks to their olfactory sense and numerous fine sensory hairs on the legs. Shortly before the workers cap the brood cells, the female mites slip unnoticed into the cells with the bee larvae.

3

A few days later, the mites lay the first eggs. The first to hatch is always a male. It is followed by up to five more eggs from which female mites hatch.

4

To feed its offspring, the mother mite pierces a feeding hole in the bee pupa which has developed in the meantime. Before the bee hatches, the mites mate again – during the bee season, the Varroa population in a hive can double every four weeks.



5

By the time the bee hatches, it is already severely diseased and weakened, because mites also transmit dangerous viruses such as Deformed Wing Virus, for which there is still no effective treatment available. As well as the bee brood, Varroa can also infest adult bees.

Viruses transmitted by varroa mites

- *Varroa* mites are carriers for virus of bees and have also been implicated to colony collapse disorder

- Viruses so far isolated in some countries of Africa: Israeli acute paralysis virus (IAPV), acute bee paralysis virus (ABPV), black queen cell virus, (BQCV), chronic bee paralysis virus (CBPV), deformed wing virus (DWV), Kashmir bee virus (KBV), and sacbrood virus (SBV), Kakugo virus.

- None of the viruses is zoonotic in nature

AU-IBAR

Value chain in relation to bee health

- **Basically it infections can occur along the 6 links of value chain:**
- 

i) inputs (mostly hives and protective clothing)

ii) Production (traditional wild honey collection, traditional wooden beehives on trees and commercial honey production using improved technologies)

iii) Logistics harvested products carried to homestead for home processing or to private/communal honey refinery)

Value chain in relation to bee health (2)

iv) Processing (either at home or private/, communal honey refinery and packaged either in tins or bottles)

v) Distribution (Farm gate. Local market, regional and international markets) and

vi) Consumption (traditional beer, in shops/ supermarkets as a breakfast sweetener and international for other uses)

Predisposing, vulnerability and risk factors

1. Harvesting – wild honey gathering and harvesting at night
2. Crude processing techniques that result in contamination
3. Poor disposal of infected materials
4. Unregulated trade and movement in bees and hive products
5. Inadequate or poor enforcement of sanitary protocols in movement of bees and hive products
6. Scavenging by birds, wild animals and other vectors
7. Inadequate capacity in understating bee health issues
8. Inadequate surveillance, diagnostics, prevention, control and treatment protocols
9. Use of contaminated hive tools and equipments
10. Inadequate disease reporting

Predisposing factors

Wild honey and night harvesting

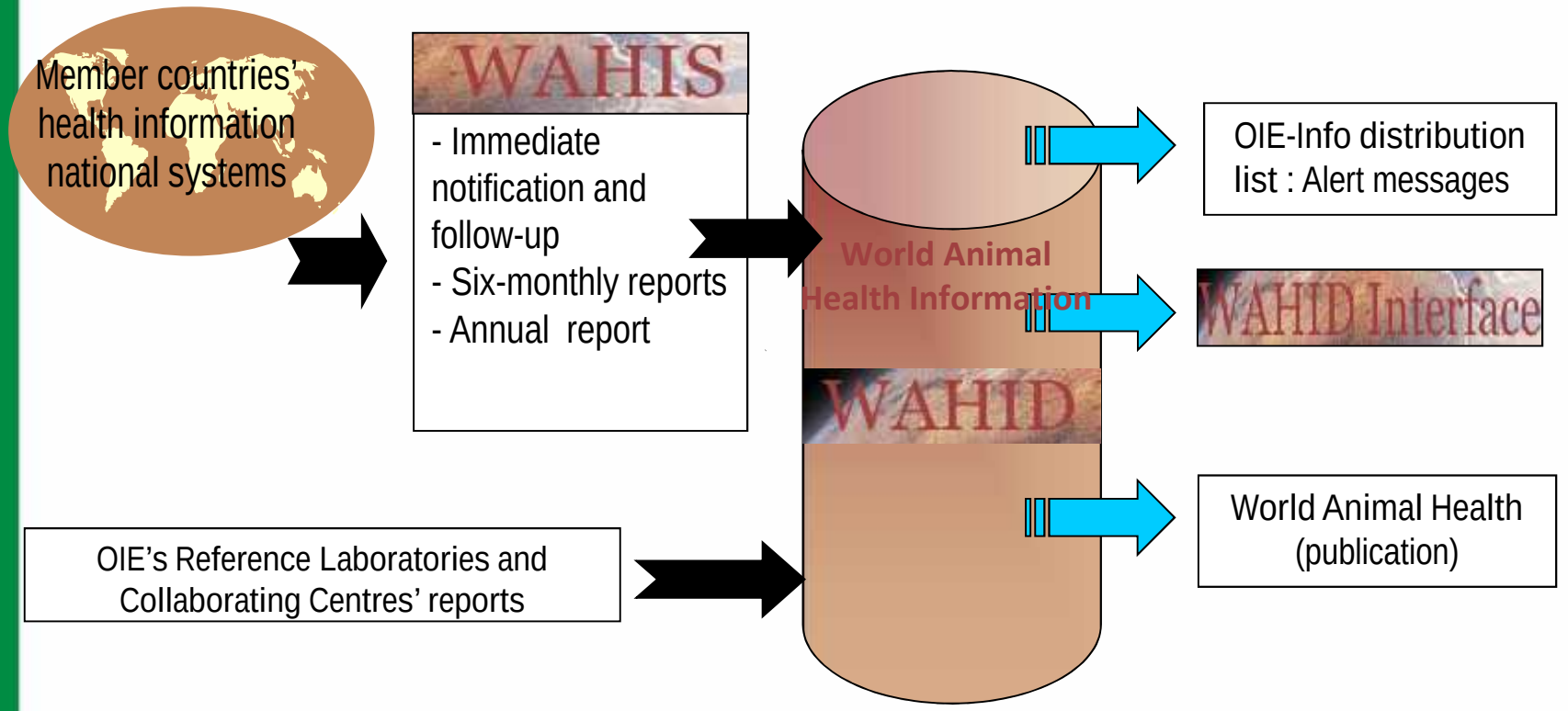
Proper disposal by burning

Inadequate disease reporting-Early Warning Disease Systems

- Reports by Members States to AU-IBAR and OIE
- Reports from worldwide network of OIE Reference and Collaborating Labs.
- Active search and tracking of unofficial sources, such as scientific publications e.g.ProMed, and Peer reviewed Journals and Publications; **with verification of members States**
- For this to be successful, there is need for improved MS surveillance through
  - National Surveillance programmes
  - internal and international resources allocation on bee health

www.au-ibar.org

AU-IBAR



www.au-ibar.org

Varroosis of honey bees, Swaziland

Information received on 05/09/2018 from Dr Roland Xolani Dlamini, Director of Veterinary and Livestock Services, Veterinary and Livestock Services, Ministry of Agriculture , Mbabane, Swaziland

Summary

Report type	Immediate notification
Date of start of the event	21/08/2018
Date of confirmation of the event	04/09/2018
Report date	05/09/2018
Date submitted to OIE	05/09/2018
Reason for notification	Recurrence of a listed disease
Date of previous occurrence	23/07/2011
Manifestation of disease	Clinical disease
Causal agent	Varroa destructor
Nature of diagnosis	Clinical
This event pertains to	the whole country

Diseases of bees

Listed in the OIE *Terrestrial Animal Health Code*

1. European foulbrood of honey bees
2. American foulbrood of honey bees
3. Acarapisosis of honey bees
4. Small hive beetle infestation (*Aethina tumida*)
5. Tropilaelaps infestation of honey bees
6. Varroosis of honey bees.

Other bee diseases not listed TAC

1. Wax Moth (*Aphomia sociella*)
2. Bee Louse
3. Honey Badgers
4. Ants (*Dorylus fulvus*)
5. Chalkbrood
6. Stonebrood diseases
7. Nosema

American foulbrood

- AFB caused by the spore-forming *Paenabacillus* larva
- It is a disease of the larval and pupal stages of honey bees.
- Larvae that are up to 3 days old become infected by ingesting spores present in their food..
- Spores germinate in the gut of the larva and the vegetative bacteria begin to grow, taking nourishment from the larva.
- AFB spores are extremely resistant to desiccation, can remain viable for more than 40 years in honey and beekeeping equipment.
- A dead larva may contain as many as 100 million spores.
- **Confirmatory laboratory diagnosis important**
- **Safe commodities**
- honey bee semen; honey bee venom; honey bee eggs.

AU-IBAR

European foulbrood

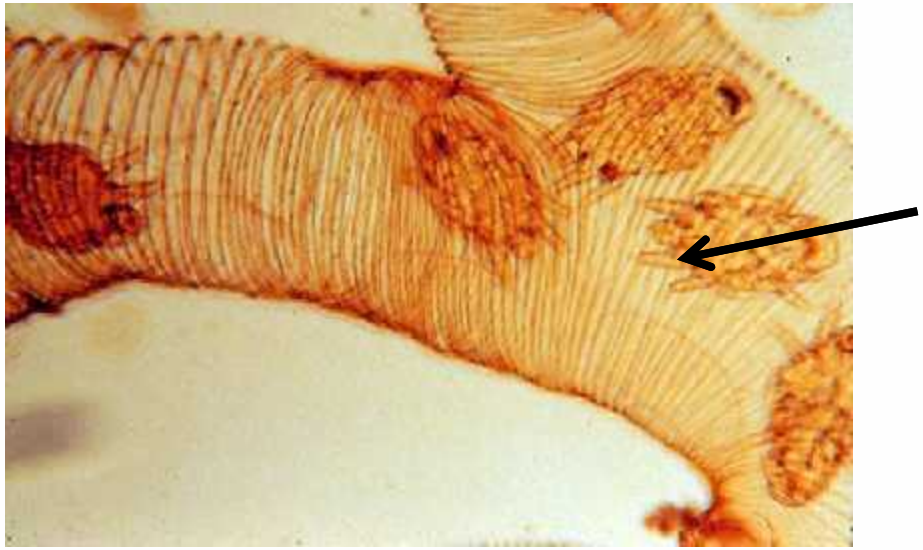
- The causative agent is *Melissococococcus plutonius* bacterium that infects the mid-gut of the bee larvae. Bacterial cells can survive several months on wax foundation.
- The infections remain enzootic because of mechanical contamination of the honeycombs.
- The infection can be self-healing when good beekeeping management practices are applied.
- EFB is considered less serious than AFB The disease requires confirmatory test either by using Rapid Test Kits or molecular diagnostic

European and American Foulbrood infestations

Main differences between European and American foulbrood	
Europen Foulbrood (EFB)	American foulbrood (AFB)
Dead larva in uncapped cell	Dead larva in capped cell
Sour smell	Smell of fish gelatin
Absence of blackening of honeycombs	Dark honeycombs, deep-set and perforated cappings
Non-ropey larva	Ropey larva
Removable flake	No removable flake

Acarine (Acarapis woodi) (Tracheal) *mites*

- Acarapisosis an infestation of adult honey bees by tracheal mite (*Acarapis woodi).*
- Parasitizes the respiratory system, newly hatched adults are most susceptible
- Spread by direct contact from one adult bee to another.
- Diagnosis generally involves the dissection and microscopic examination of a sample of bees from the hive.
- **Safe commodities**
- honey bee semen;
- honey bee venom.



Ectoparasite mites: *Tropilaelaps*

- *Tropilaelaps clareae* and *T. mercedesae* are considered threats to honeybees.
- The mite is an ectoparasite of bee brood of honey bees
- Difficult to survive for periods of more than 21 days away from bee brood.
- Infestation spreads by direct contact from adult honey bee to adult honey bee, and by the movement of infested honey bees and bee brood.

Small hive beetle: *Aethina tumida*

- An infestation of bee colonies by the beetle *A. Tumida*, attracted to bee colonies to reproduce, but can survive independently
- Adult female beetles can live for at least six months, can survive at least two weeks without food
- Female is capable of producing up to thousands of eggs over its lifespan
- Can fly up to 6-13 km from its nest site, it is capable of dispersing rapidly and directly invading new hives.
- The movement of adult bees, honeycomb and other apiculture products and used apicultural equipments spreads the disease

Wax Moth (*Aphomia sociella*)

- The Wax moth will not attack the bees directly, but feed on the wax used by the bees to build their honey comb.
- Larvae of wax moth hatch from eggs laid in cracks in the hive.
- They protect themselves with a greyish web.
- They make tunnels in the combs and contaminate honey with their excreta.

Bee Louse:

- This is a parasite of bees reported in countries of Africa.
- The larvae are hatched in the wax and spoil the combs.
- The adult louse is found on the thorax of bees. Several can be seen on the queen.

- Adapted from Source FAO

Honey Badgers:

- Honey Badgers are reported in most countries of Africa.
- These are small strong animals which spoil hives and eat honey.

Honey badger

Damage on hives by the honey badgers (mud hive house)

Control of Honey Badgers:

- To control them, hives are hung with wires so that they swing when the badgers climb on them.
- This makes the badgers to fall therefore discouraging them.
- Construction of cemented houses

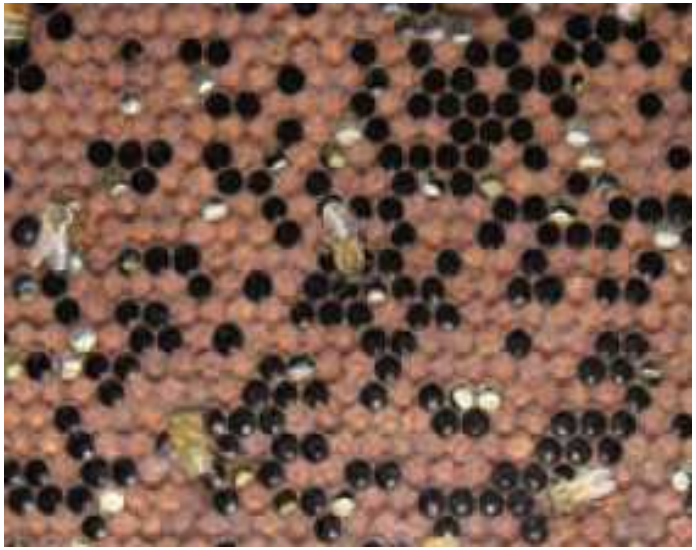
Ants (Dorylus fulvus)

- Ant eats or carries off any comb contents honey, pollen and brood.
- They kill bees first, rob their products, initiate aggressiveness in bees, lead to absconding of honey bees.
- Methods for protection against ants are such as placing

(1) inner tube, 2) smooth iron sheet and 3) tin filled with used engine oils.

Fungi diseases of bees: Chalkbrood

- *Ascophaera apis*, a fungal disease infests the gut of the larva. \
- The fungus will compete with the larva for food, ultimately causing it to starve.
- The fungus will then go on to consume the rest of the larva's body, causing it to appear white and ’chalky‘ or mummies at entrance of hive



Stonebrood diseases

- Stonebrood is a fungal disease caused by Aspergillus spp.
- It causes mummification of the brood of a honey bee colony.
- When a bee larva takes in spores, they may hatch in the gut, growing rapidly to form a collar-like ring near the head.
- After death, the larvae turn black and become difficult to crush, hence the name stonebrood. \
- Eventually, the fungus erupts from the integument of the larva and forms a false skin.
- Worker bees clean out the infected brood and the hive may recover depending on factors such as the strength of the colony, the level of infection.

Nosema

- Nosema apis is a microsporodium that invades the intestinal tracts of adult bees and causes Nosema infection is also associated with black queen cell virus.
- It is normally only a problem when the bees cannot leave the hive to eliminate waste (for example, during an extended cold spell

AU-IBAR

OIE honey bee diseases reporting (2009 and 2010)

- WAHID - the presence or the suspected presence of bee diseases and pests was notified by 179 Members in year 2009 and by 161 Members in year 2010.

- African countries notified the presence of bee diseases and pests (table 1 and 2) but if compared with the scientific information available worldwide it seems that bee diseases are under reported in Africa.

AU-IBAR

occurrence of bee diseases in Africa in year 2009

"OIE Diseases of honey bees Ezulwini, Swaziland

14 - 17 June 2011

Disease	Country	Occurrence
Acarapisosis of honey bees	Kenya	Suspected
American Foulbrood of honey bees	Algeria	Clinical disease
	South Africa	Clinical disease
Small hive beetle infestation (Aethina tumida)	Congo (Dem. Rep. of)	Suspected
	Sudan	Infection without clinical manifestation
Tropilaelaps infestation of honey bees	Congo (Dem. Rep. of)	Suspected
Varroosis of honey bees	Algeria	Clinical disease
	Mozambique	Infection without clinical manifestation
	Swaziland	Suspected
	Zimbabwe	Clinical disease

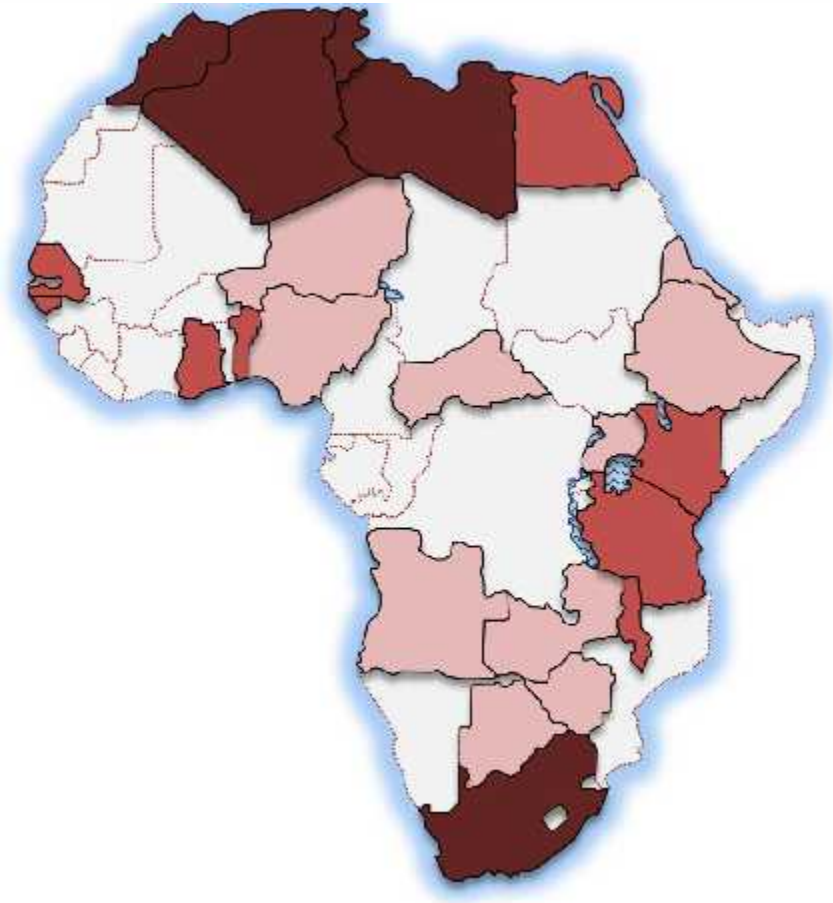
www.au-ibar.org

occurrence of bee diseases in Africa in year 2010

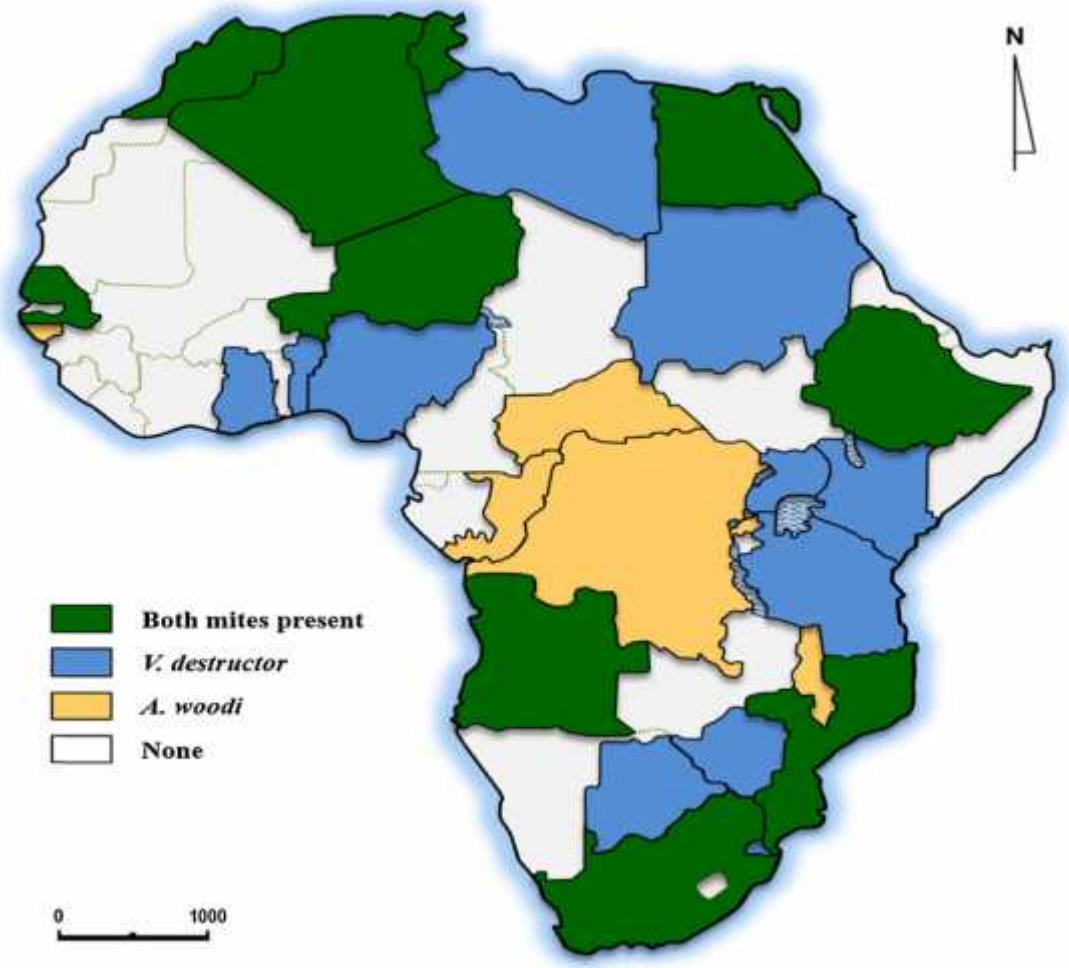
Disease	Country	Occurrence
American Foulbrood of honey bees	Algeria	Clinical disease
European Foulbrood of honey bees	Algeria	Clinical disease
Small hive beetle infestation *(Aethina tumida)*	Sudan	Infection without clinical manifestation
	Algeria	Clinical disease
Varroosis of honey bees	Madagascar	Clinical disease limited to certain zones
	Swaziland	Suspected
	Zimbabwe	Clinical disease

Distribution of pathogen groups (bacteria, fungi and viruses) associated with honeybees in Africa; Source Pirk et al 2016

- The darker the colour, the more varieties of bacteria, fungi and viruses



Distribution of parasites (V. destructor and Acarapis woodi) associated with honeybees in Africa: Source Pirk et al 2016 .
Countries depicted in white indicate no reported presence of parasites or insufficient data

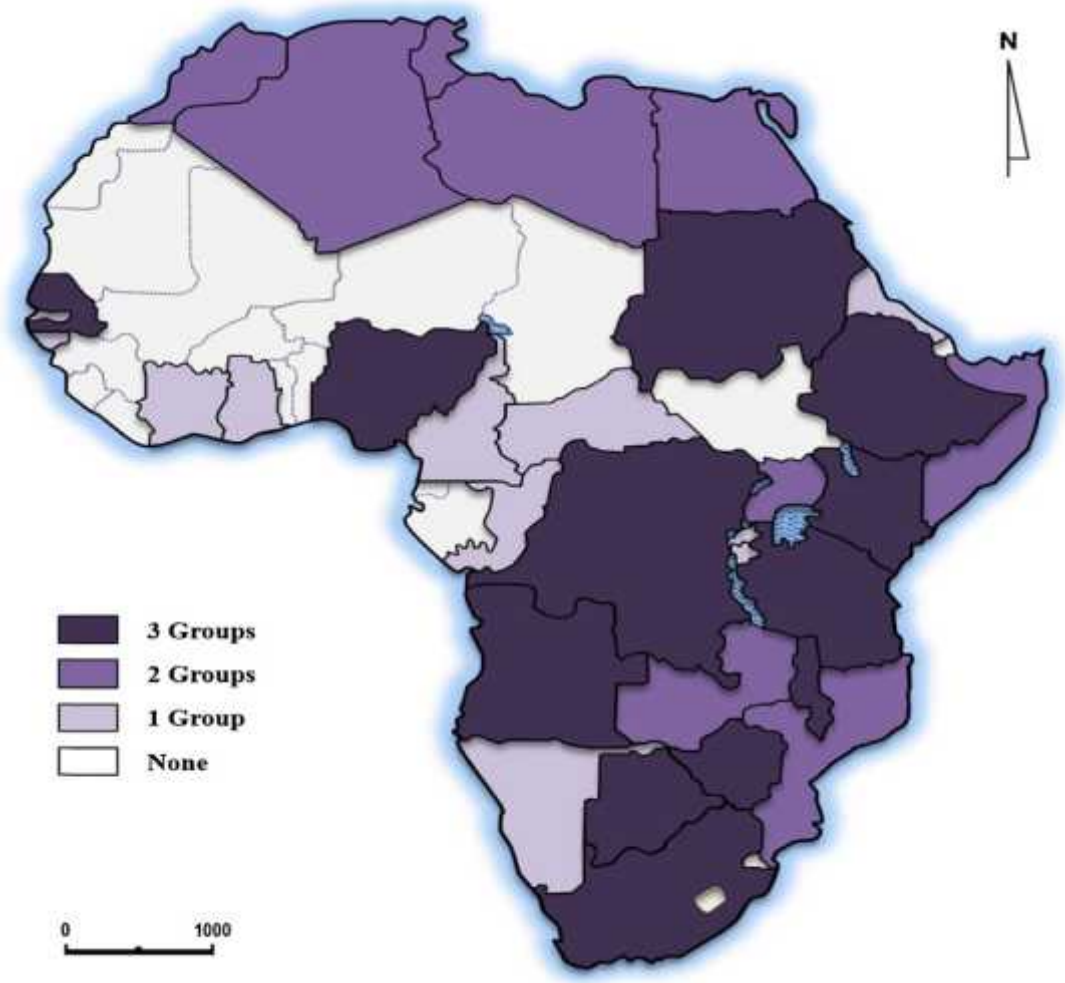


www.au-ibar.org

PROVIDING LEADERSHIP IN THE DEVELOPMENT OF ANIMAL RESOURCES IN AFRICA

AU-IBAR

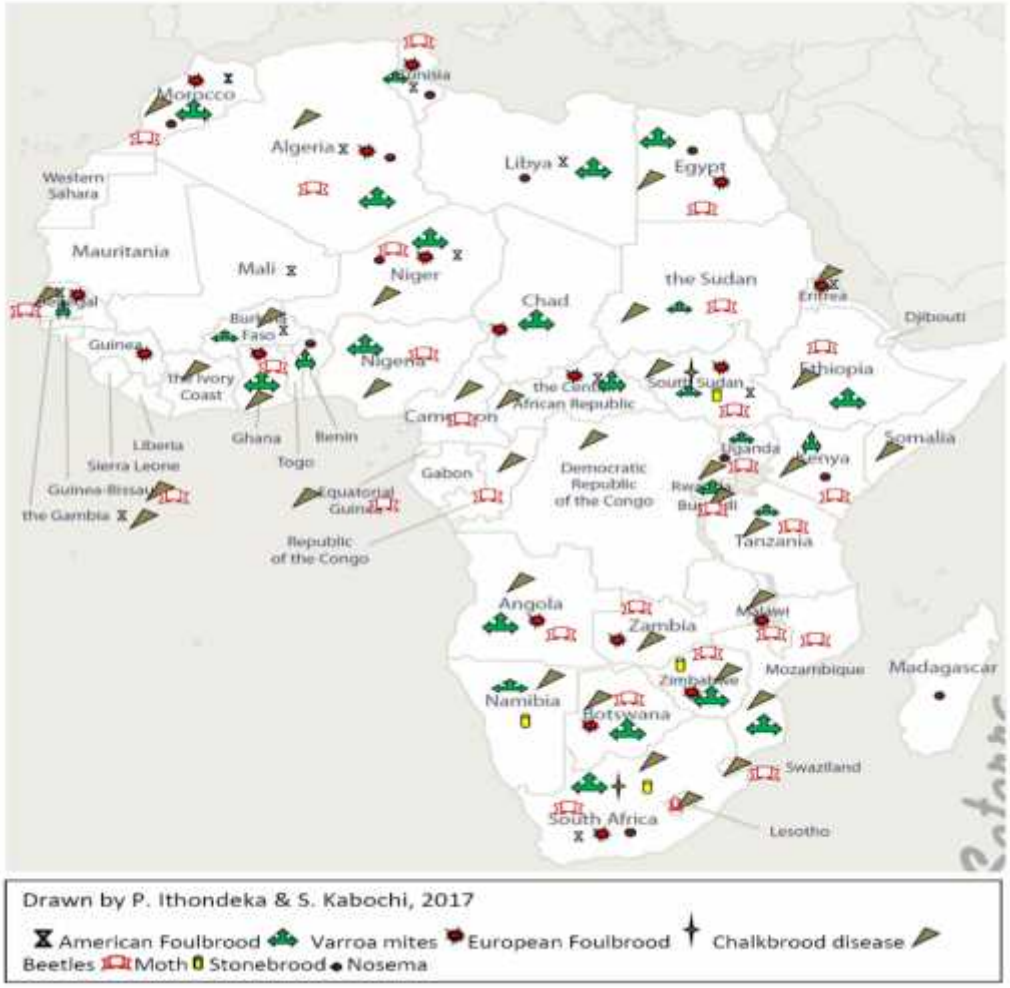
Distribution of pest and predator groups (insects, birds and mammals) associated with honeybees in Africa: Source Pirk et al 2016



www.au-ibar.org

AU-IBAR

December 2017 bee and pests African map



www.au-ibar.org

PROVIDING LEADERSHIP IN THE DEVELOPMENT OF ANIMAL RESOURCES IN AFRICA

Bee and hive products Trade

- In addition, the following are important considerations for trade between trading partners:
- Bees must not show clinical signs of bee diseases and pests on the day of shipment;
- Animals must be kept in quarantine for the period of time required by the importing nation prior to shipment;
- Use of risk assessment results to promote trade. (video)

Summary for General recommendations for bee health

- Good Hive Management
- Need for capacity building
- Providing Education to Bee Keepers
- Legislations and policy on bee and bee hive products health
- Quarantine measures provision
- Residue Analysis
- Honey standards
- Export of bee hive products and bees protocol
- Individual Member State to give priority and allocate funds to bee health like other animal diseases
- Reporting to OIE and AU-IBAR to be improved.
- Reporting does not bar the MS from trade internally or internationally but opens opportunities for assistance and transparency

AU-IBAR

THE END

www.au-ibar.org