Hive Monitors
Each hive to be monitored is fitted with selected sensors. This includes a hive scale and optional sensors for hive humidity, brood temperature and colony acoustics (flight noise, fanning noise and hive activity). The data recorded is transmitted wirelessly to a Monitor Gateway unit in the apiary.

Monitor Gateway
One Monitor Gateway is required per apiary. It is located within 20m of the hives fitted with monitors. It collects data from all hive monitors at the apiary and transmits it to Arnia’s User Interface for analysis and presentation. The Monitor Gateway is battery powered and has its own transmission capability. No power or WiFi is required in the apiary.

User Interface
Users log in to a secure account from any internet enabled device to access data on their hives through the Arnia User Interface. No additional software is required. The data is presented with clear, easy to read graphics so you can see at a glance the current situation in your hives. Access to current and historical values enables you to generate graphs for selected periods thus allowing trend observation and comparative analysis of data within a colony as well as between different colonies.
Arnia is unique in combing colony acoustics monitoring with other parameters such as brood temperature, humidity, hive weight and apiary weather conditions. We can monitor and interpret the sound of a bee colony to assess colony behaviour, strength and health. Our system provides a unique insight into hive conditions and bee behaviour which will help you maintain strong, healthy and productive colonies.

**Sensory Information**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Flight Activity</td>
<td>Profile daily flight activity, compare with different hives, identify weak/low levels of activity and foraging. Directly compare flight with other measurements such as weight to assess colony productivity.</td>
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<tr>
<td>Fanning Activity</td>
<td>Identify when the bees are fanning. Display graphs of fanning activity over time; compare fanning activity between different hives. This is a useful indicator of bees processing nectar, ventilating the hive or stress.</td>
</tr>
<tr>
<td>Colony Development</td>
<td>Monitor colony development, spring build up and reduction over the year. Compare build-up between different colonies and hive locations. Identify weak colony build up.</td>
</tr>
<tr>
<td>Hive Humidity</td>
<td>Track humidity levels over the season, compare humidity levels between different types of hives, identify when a hive needs ventilating.</td>
</tr>
<tr>
<td>Brood Temperature</td>
<td>Remotely assess brood and queen status. Identify when the queen has stopped laying and the colony has become broodless. Identify when a queen has started laying without opening the hive.</td>
</tr>
<tr>
<td>Hive Weight</td>
<td>Track weight gain over time, map the start and finish of the nectar flow, identify when honey boxes are full, compare hive productivity. Monitor winter store levels and identify if the bees need feeding.</td>
</tr>
<tr>
<td>Apiary Weather Conditions</td>
<td>Record temperature in the sun, temperature in the shade and rainfall. Directly compare weather data with the hive data.</td>
</tr>
</tbody>
</table>

Other features available in our User Interface:-

- **Instant Alerts:** Receive automatic email alerts of events at the hive so you can take immediate action; bees need feeding, hive needs ventilating, colony queenless, add or remove honey boxes, robbing!

- **On Line Hive Inspection Records:** Record inspections, manipulations and treatments on line and compare with monitor data.

- **Maps:** Locate hives and forage area on map, see summary hive and apiary status.

- **Downloads:** Raw data can be downloaded for further analysis.
The hive view shows all monitored hives with current sensor readings and weather conditions. You can access historical readings from any of the sensors by simply touching or clicking the sensor icons. This opens the relevant graph for that sensor thus allowing trend observation and comparative analysis of data within a colony as well as between different colonies. Example graphs are shown on the following pages. You can also click here to see video demonstrations.
• Bees thermo regulate their brood to 34°C
• The brood temperature stabilising to 34°C shows the queen has started laying
• This graph compares brood temperature from 2 hives. In the first the queen starts laying 25 February and in the second around 6 March.
Queenless?

- Brood temperature drops and becomes unstable
- In this case the queen had escaped through the queen excluder into the honey box!
- When she was put back in the brood box and started laying the brood temperature returned to normal
Nectar Flow

• Graph shows increase in hive weight and the nectar flow.
• Track the nectar flow and identify when the honey boxes are full (the 2 big step ups in weight are honey boxes being added!)
• Identify if the bees need feeding in winter
• Compare colony productivity
Nectar Flow and Processing

Weight (pink line) increases during the day as nectar is collected by foraging bees (green line shows corresponding daytime peaks in flying activity). Weight decreases slightly at night as the nectar is processed by bees fanning (brown line shows increase in night time fanning).

- Evaluate foraging efficiency of different hives...
- Track nectar processing...
Robbing

- Sharp increase in flying noise with sudden drop in weight
- Following an in-hive treatment this colony succumbed to robbers
- It only took 2 days to rob 10 kg of honey!
On Line Inspection Logs

Easy on line recording of inspections, manipulations and treatments:

- Brood size and stage
- Pollen/Stores
- Queen/Queen cells
- Bees mood/patience
- In hive treatments
- Winter feeding
- Health issues
- Notes
- ALERTS!
Maps

Locate your hives and forage area on map, see summary hive and apiary status. Full maps functionality, zoom in and see in satellite view also.