Points on Wintered Hive Behavior in 20 in. square hives, 6 5/8 deep, 3 high, 3 x 3/8 entrance, 1 in hole 2<sup>nd</sup> super, facing south (Bill Turner)

## Unprotected Hives/Checked

- tightest insulating shell
- stayed farthest from upper opening
- brood more centered
- below -10°C wooded supers lose more heat than gain by sun
- temperature changes affect these the most
- greatest contraction occurred early morning or at night with temp. drop
- solar radiation markedly affected cluster movement
- internal hive temperature lagged behind outside by 1-2 hours
- warmer weather increased brood to equal packed populations by main honey flow
- changing mean daily temp. more affect than night/day changes

## **Insulated Hives**

- compactness of insulating shell was less
- bottom entrance might be used
- outside temp. above 0°C able to warm entire hive above 5°C
- greatest cluster changes due to temperature changes outside hive
- cluster volume changed little between night and day
- mean average temperature outside cluster 5<sup>0</sup>C higher then in unpacked
- hive temp. lagged 6 8 hours with changes outside hive and was only 1/3 as great as outside
- produce brood earlier and in greater amounts as long as pollen was available (honey too)
- maintance of cluster temp. easier if insulated

## **General Points**

- disturbed clustered bees require 3 days to return to normal
- lowest temp. over 5 years was  $-20^{\circ}$ C
- January cluster smallest insulating shell
- upper entrance enabled fly outs on warmer sunny days(better than if just a bottom opening)
- above improves hive health(older bees gone)
- cluster movement, location, and shape just as large between groups as within the group
- closed hive top entrance allowed bees to move closer to it
- stronger colonies produce greater movement to food / weaker ones can not produce enough heat for movement
- changes in entrances(top-bottom) does not change temp. distribution within a hive
- cluster heat is not lost to surrounding air and little air circulates in a hive
- max. hive temp. has no relationship to ambient temperature except when heat suddenly added
- Nosema seen to waken colonies
- lack of honey and pollen more detrimental than low temperatures