University of Namur, 27 January 2019

CARI

Journée de Namur

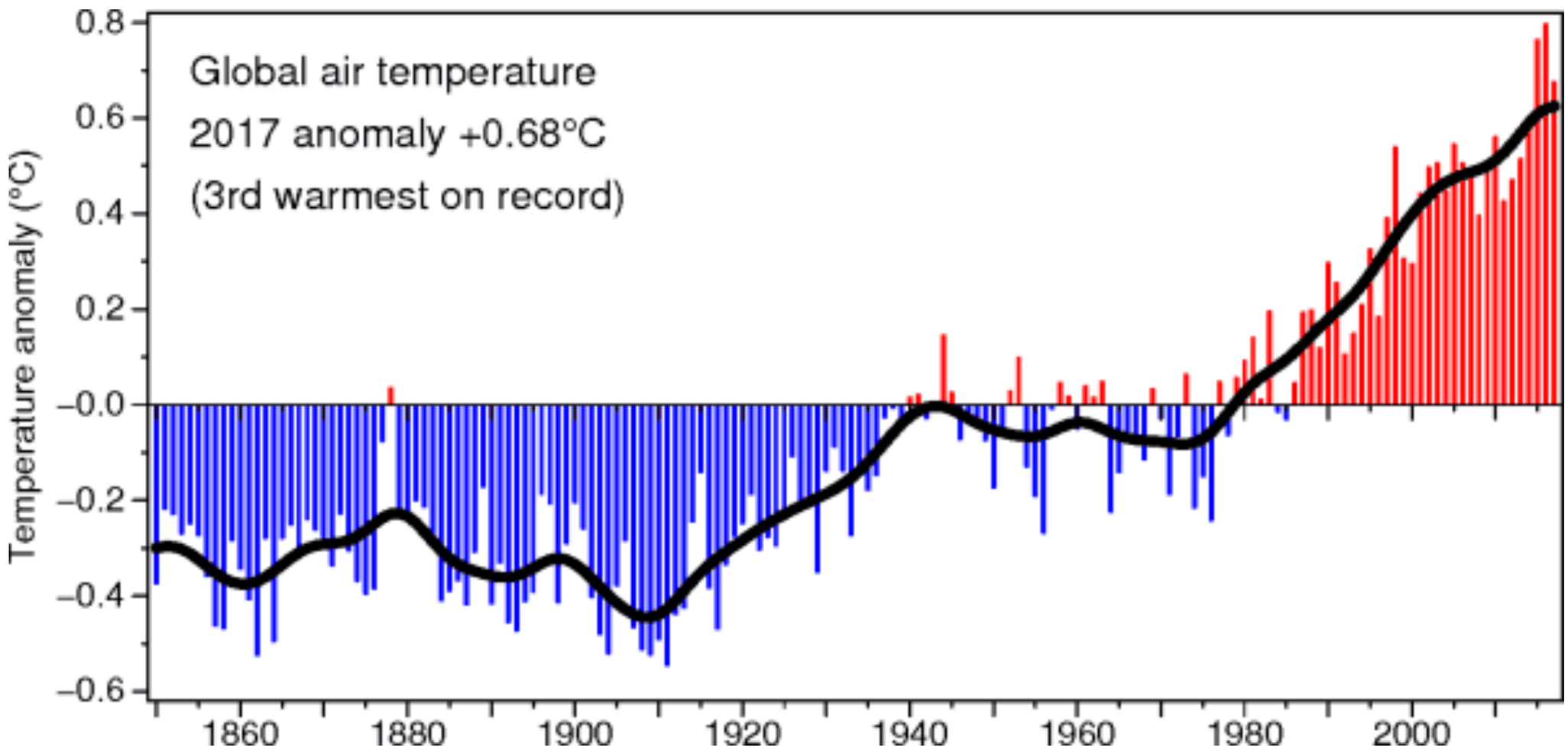
Impact of climate change on apiculture

Antonio Nanetti

CREA - Research Centre of Agriculture and Environment

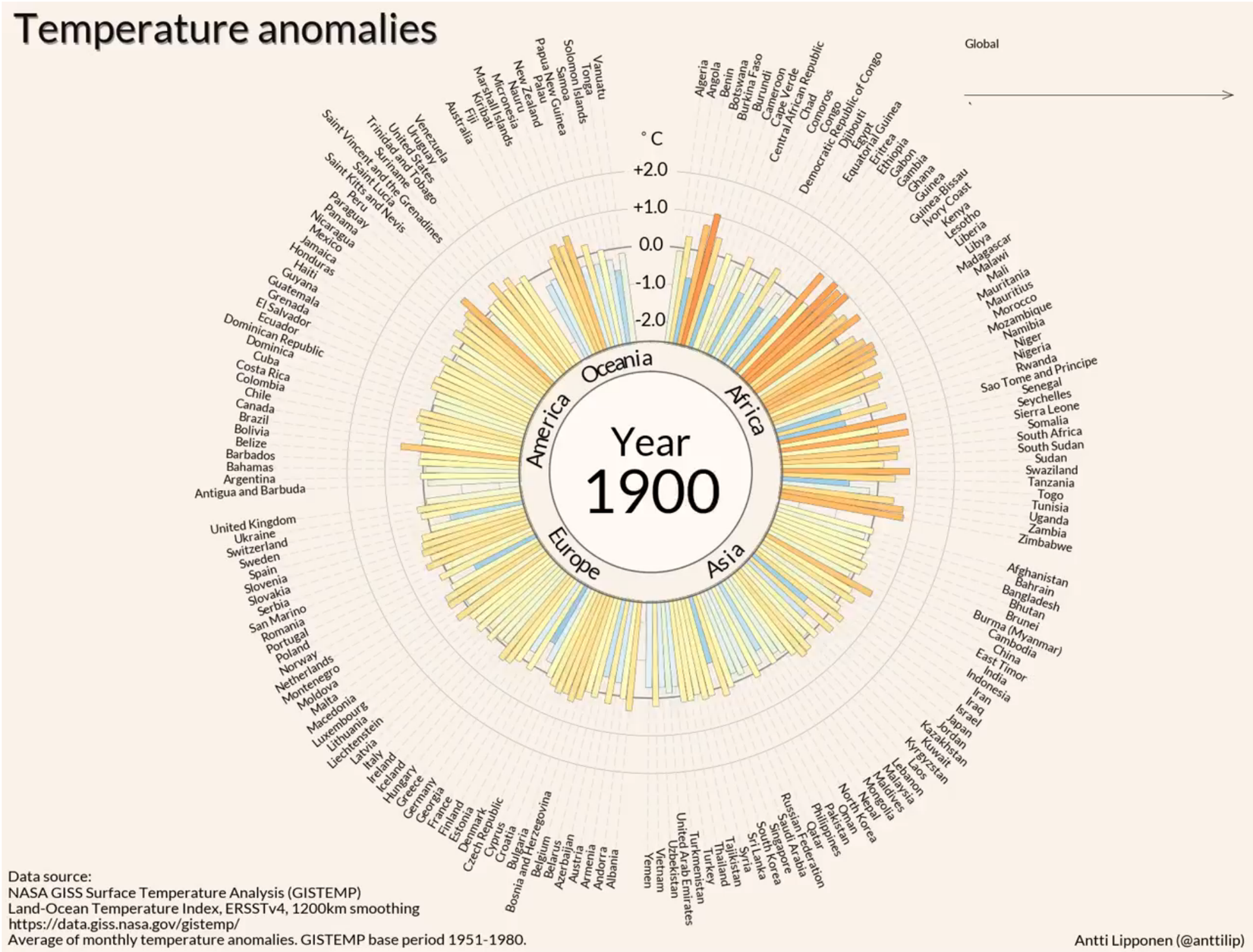
antonio.nanetti@crea.gov.it

A warmer planet

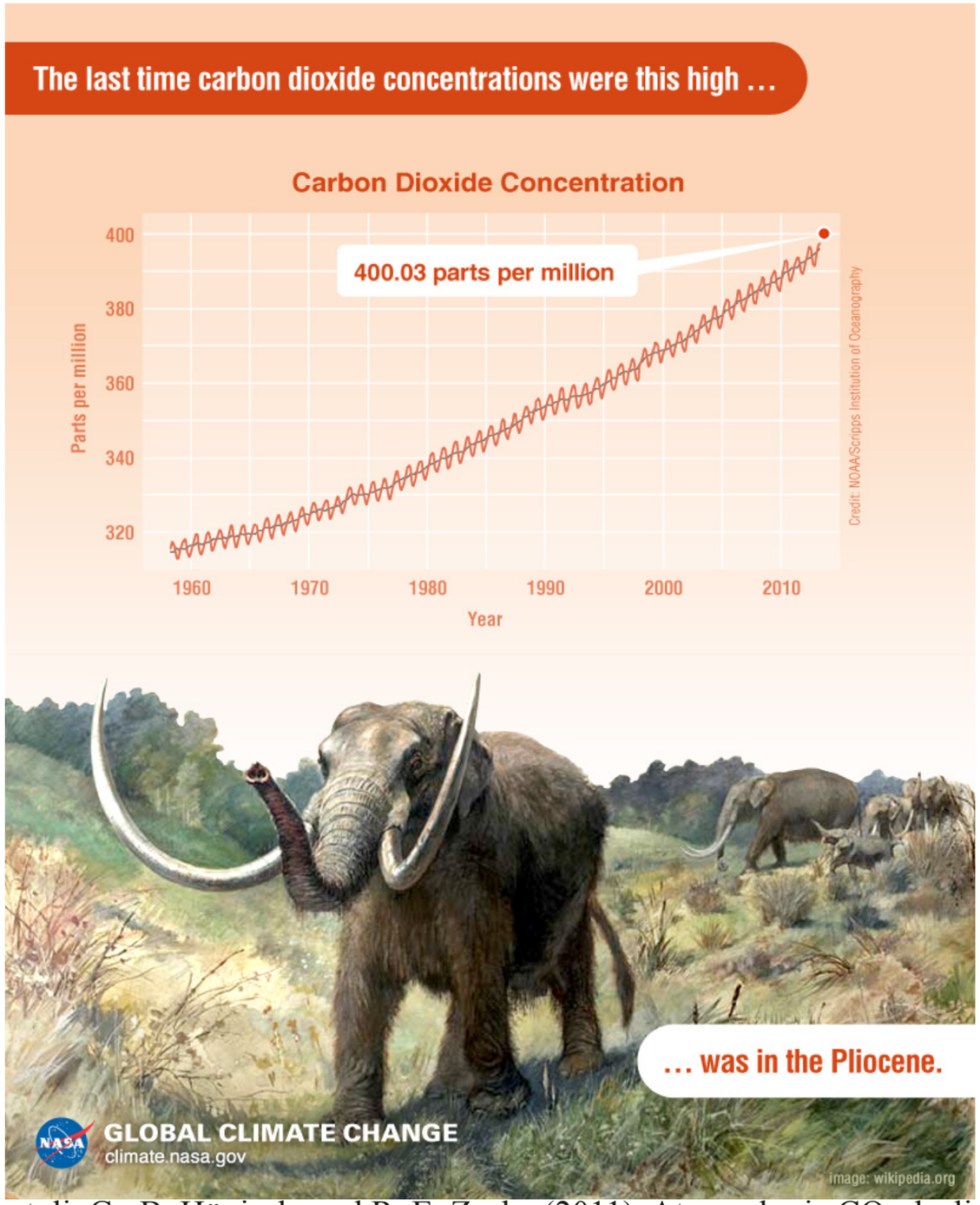


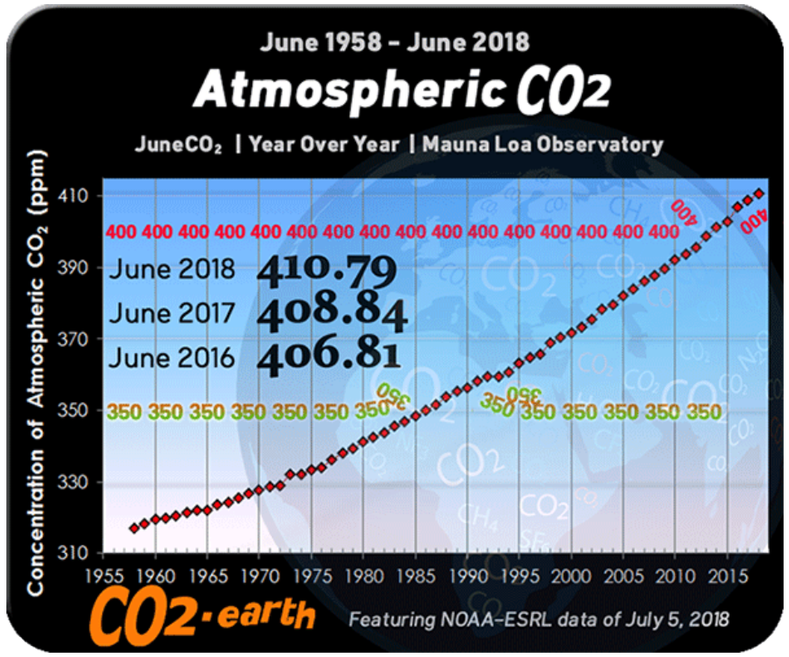
http://www.cru.uea.ac.uk/

A warmer planet

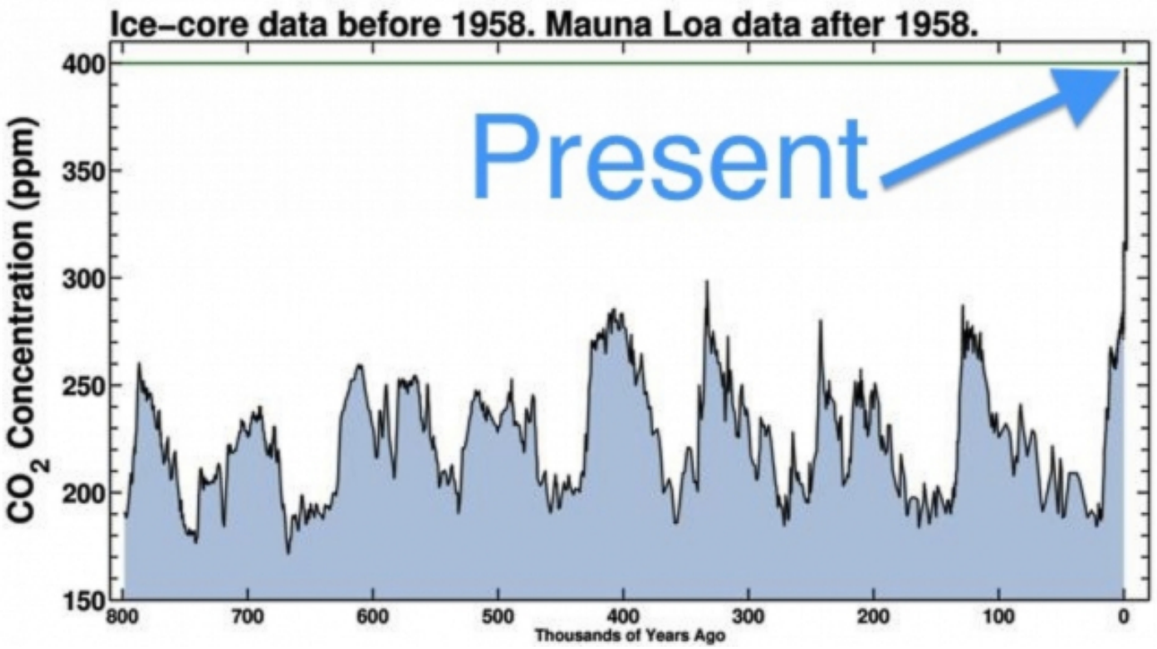


Welcome to the Antropocene!





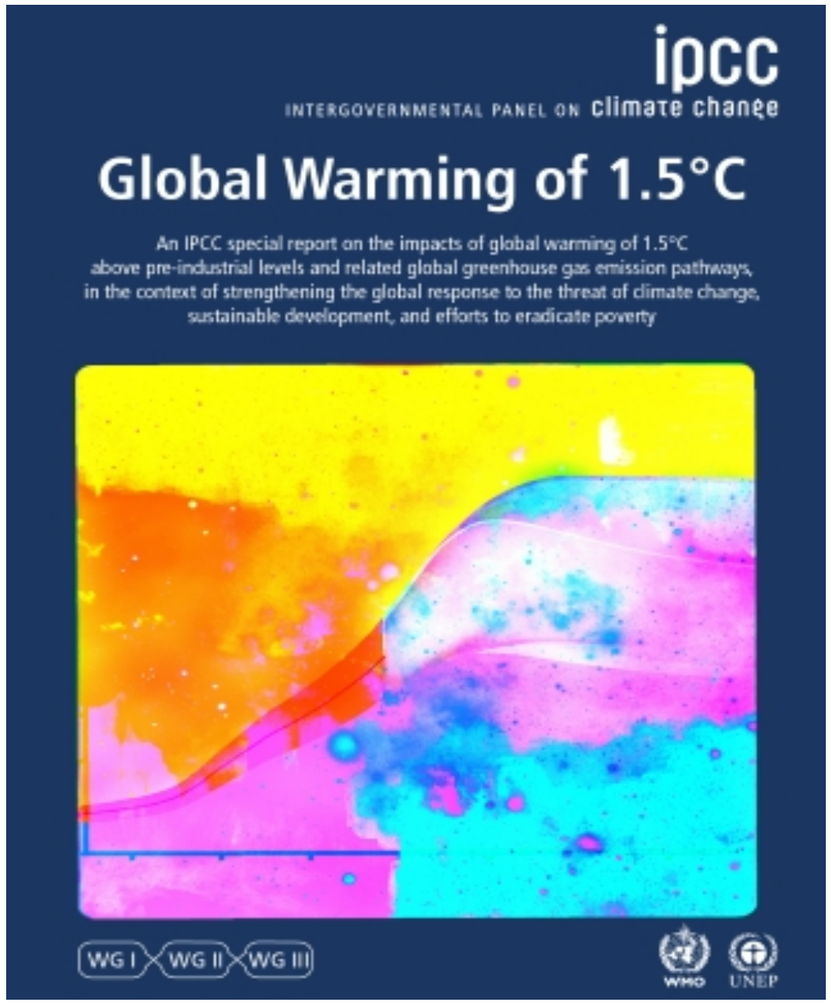
https://www.co2.earth/



Bartoli, G., B. Hönisch, and R. E. Zeebe (2011), Atmospheric CO_2 decline during the Pliocene intensification of Northern Hemisphere glaciations, *Paleoceanography*, 26,

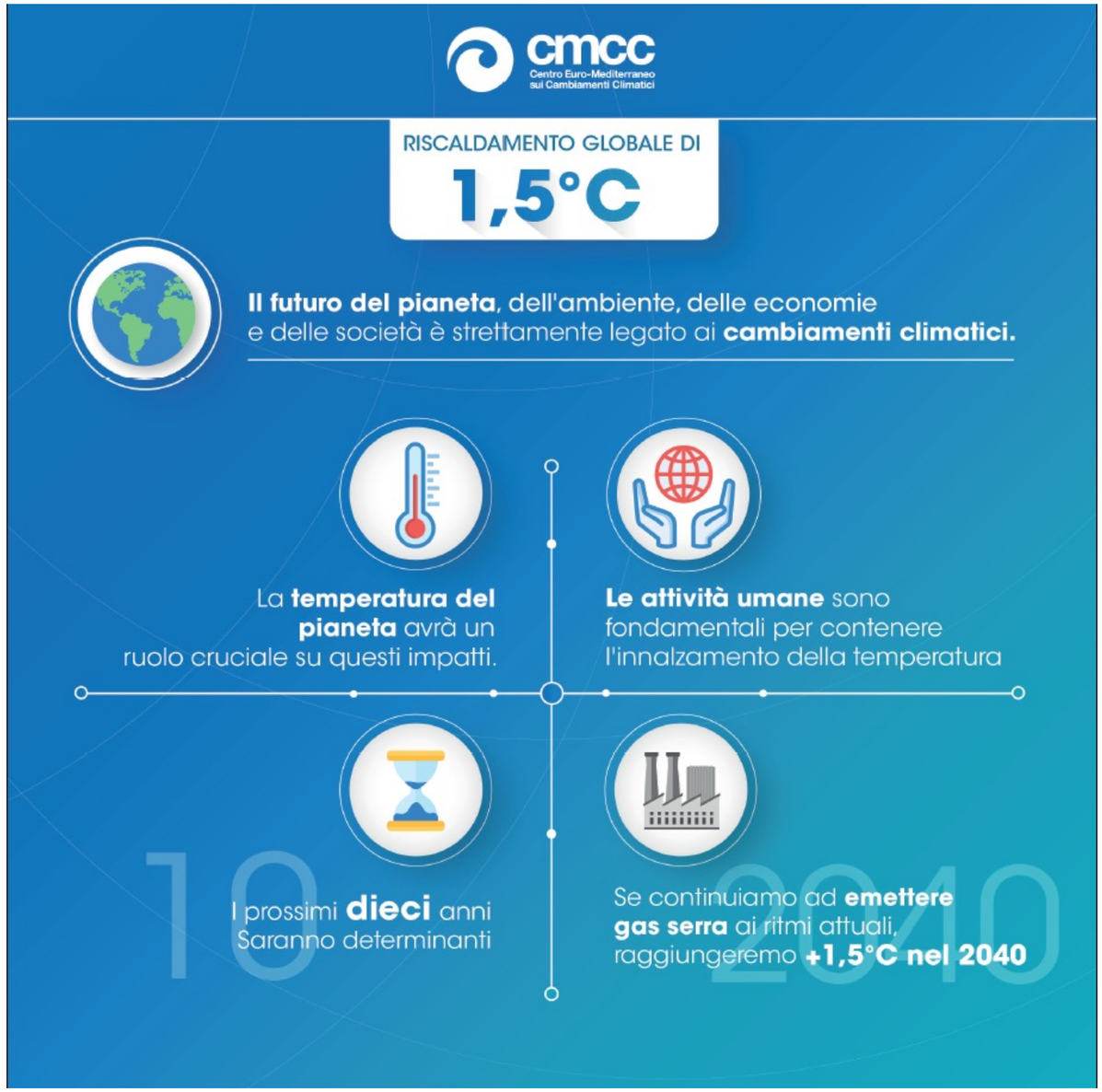
Intergovernmental Panel on Climate Change (IPCC)

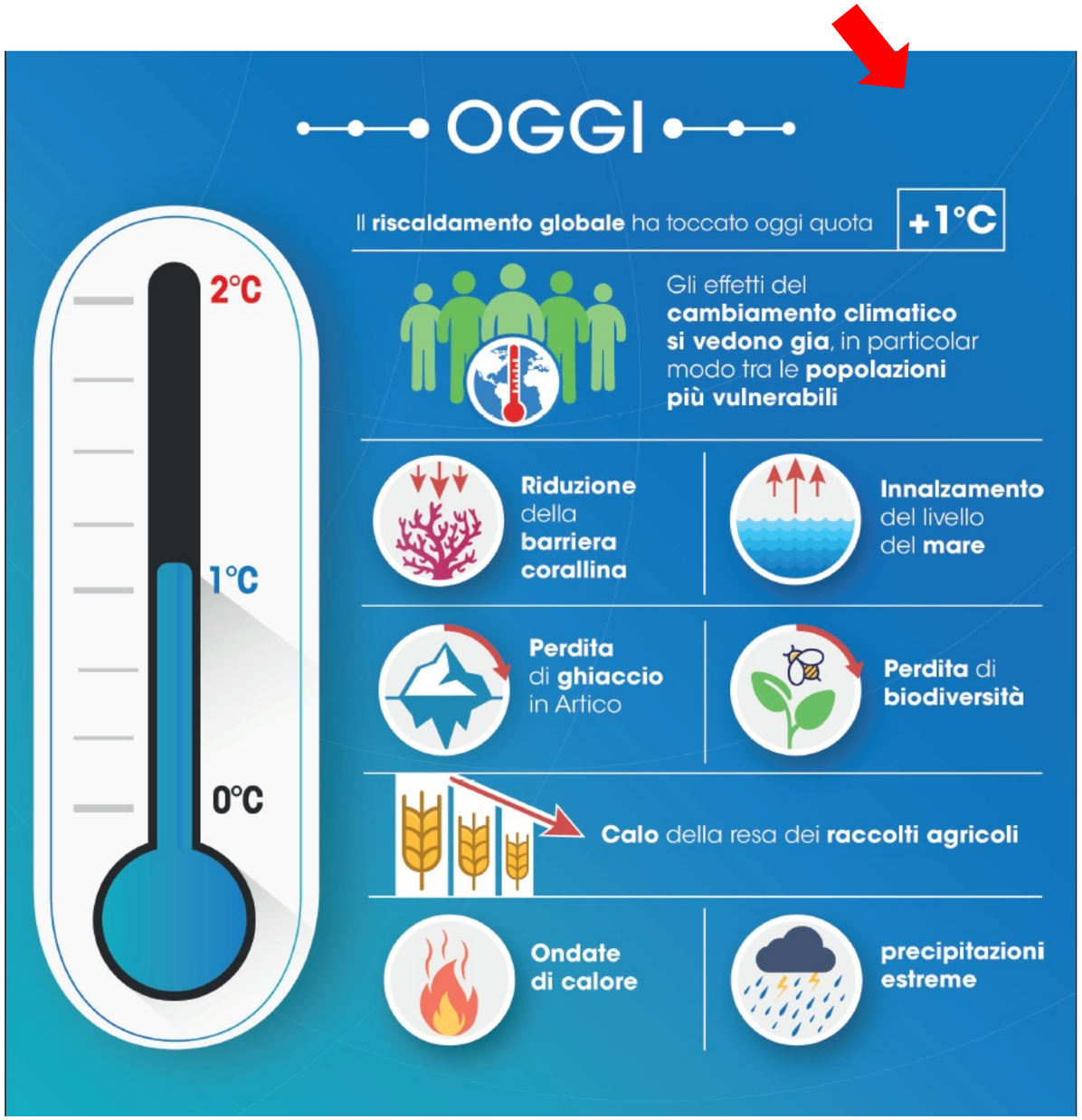
- Approx. 9000 scientists (91 authors and >6.000 scientific references)
- Intended for the policy makers
- Present CO_2 emissions are no more compatible
- **+1,5 °C**: damage limitation
- **2030**: reduce CO_2 emissions de CO_2 of 45%
- **2050**: bring to zero the net CO_2 emissions



http://www.ipcc.ch/report/sr15/

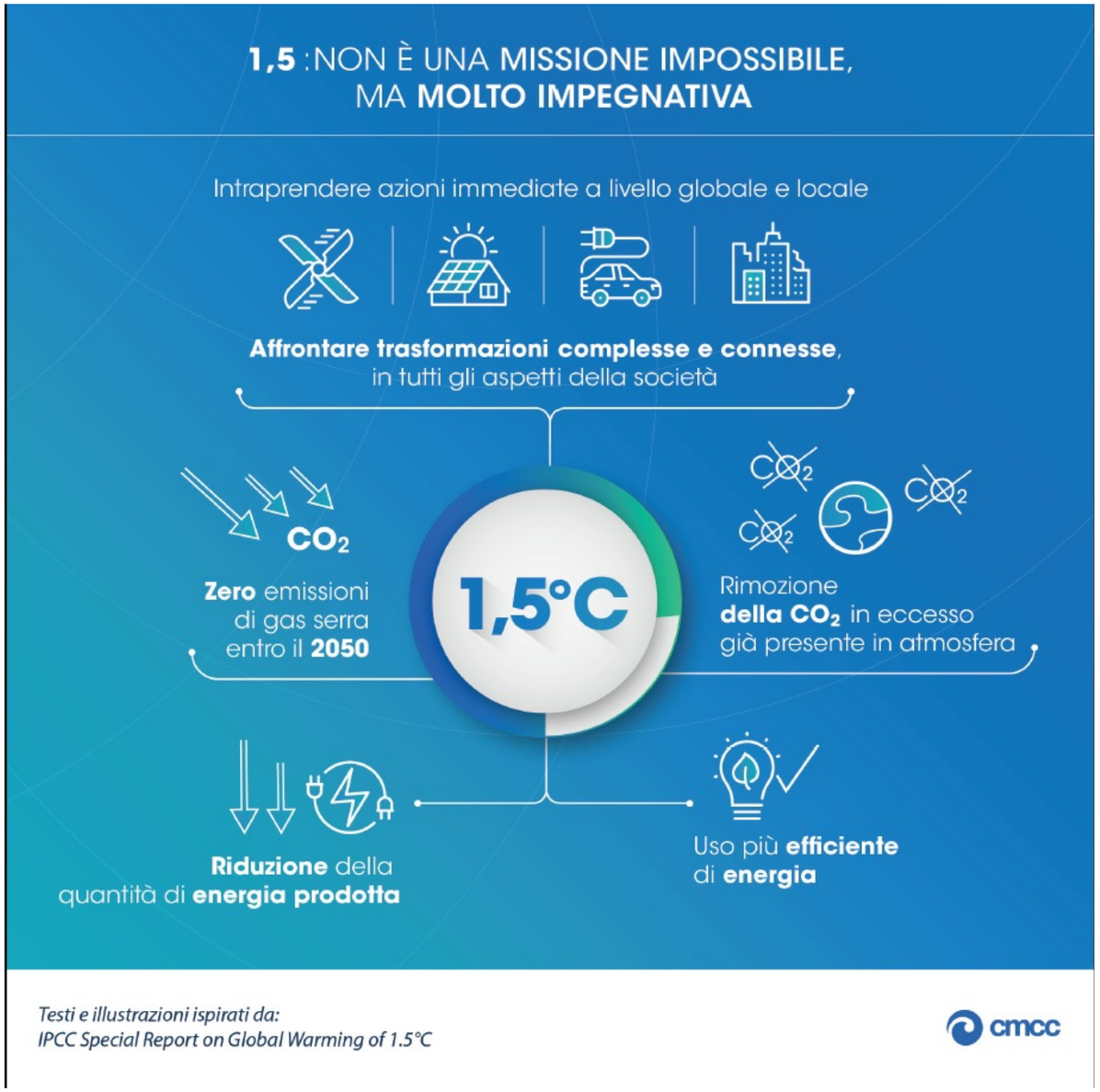
IPCC Special Report





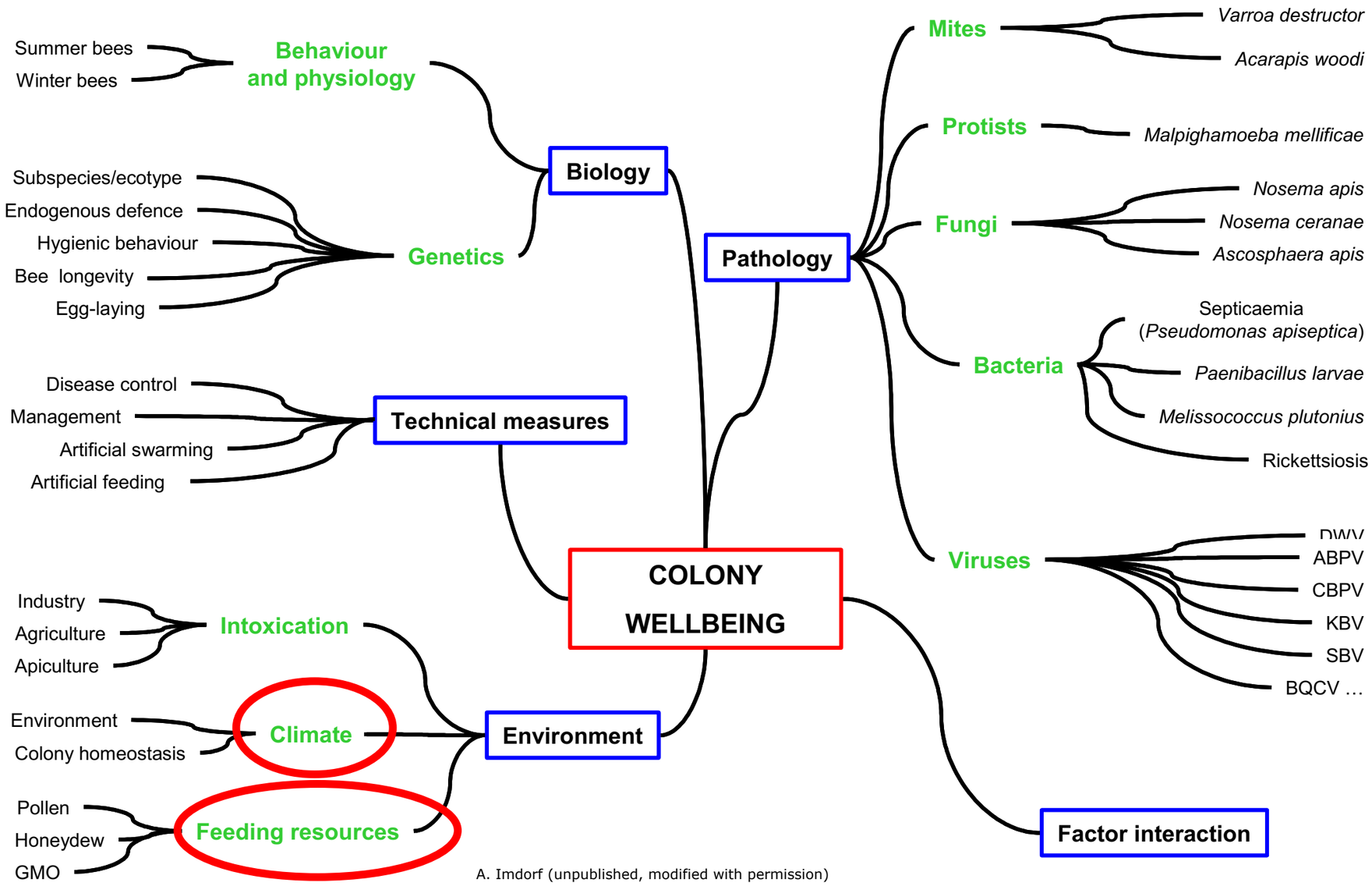
www.cmcc.it

IPCC Special Report



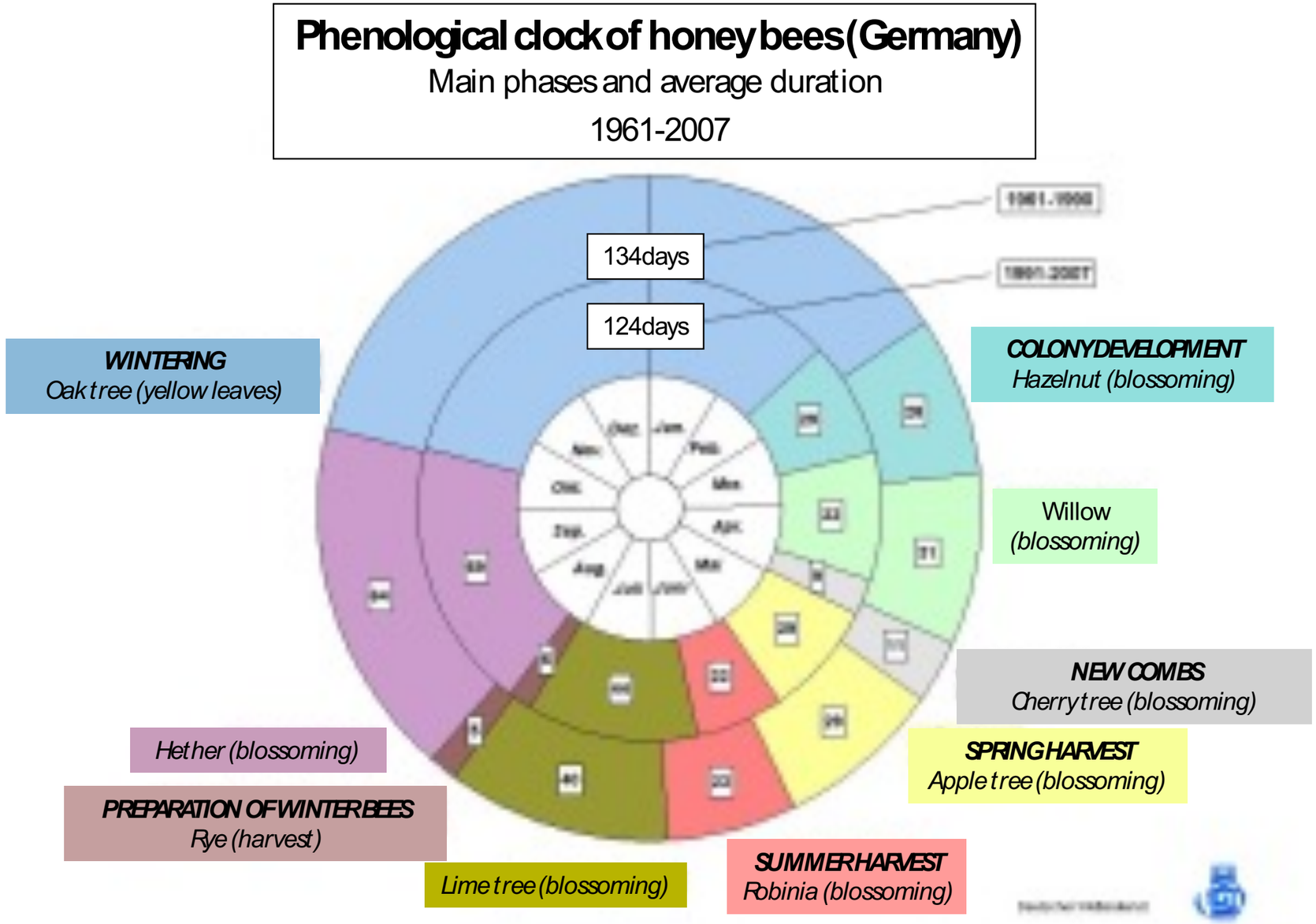
www.cmcc.it

Factors of colony wellbeing



A. Imdorf (unpublished, modified with permission)

Warming indices phenology changes



Beekeepers notes on *Robinia* blossoming

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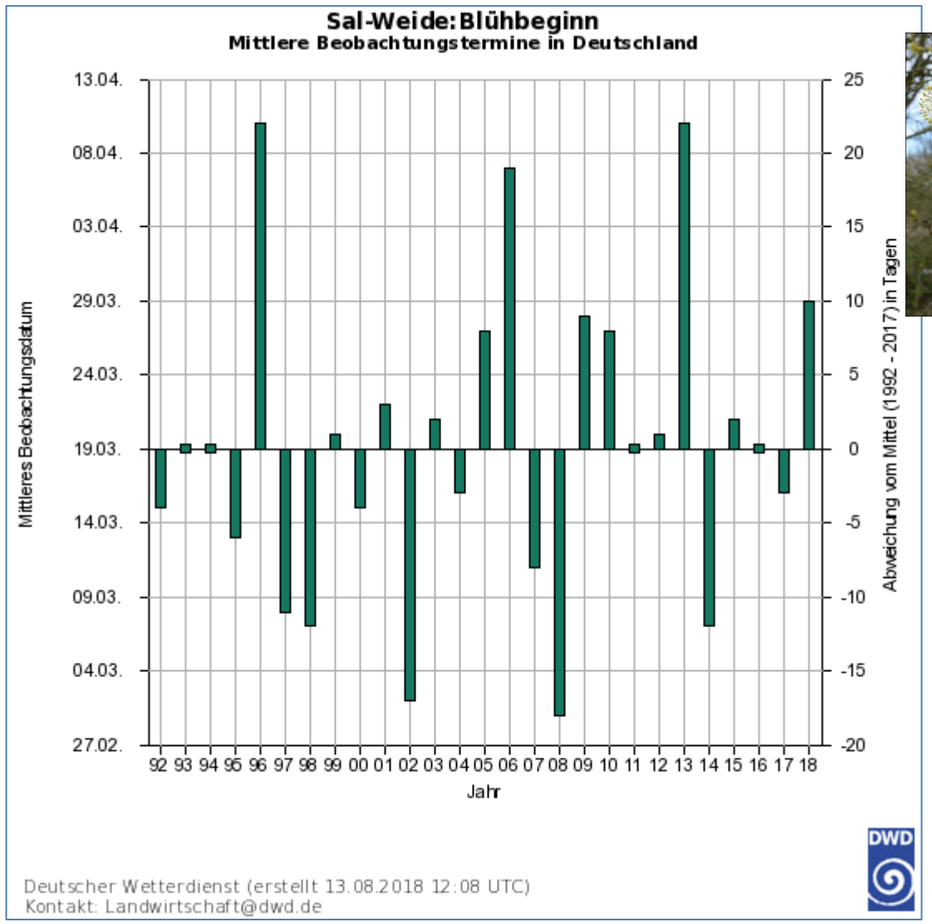
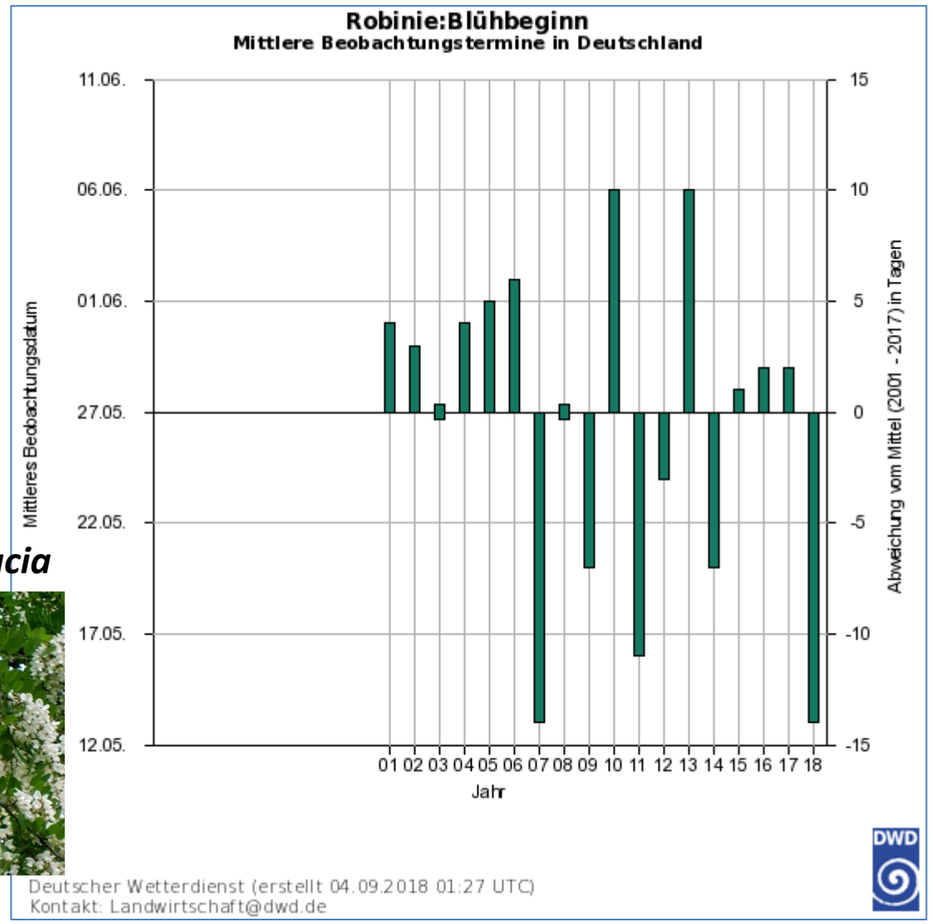
Blossoming period



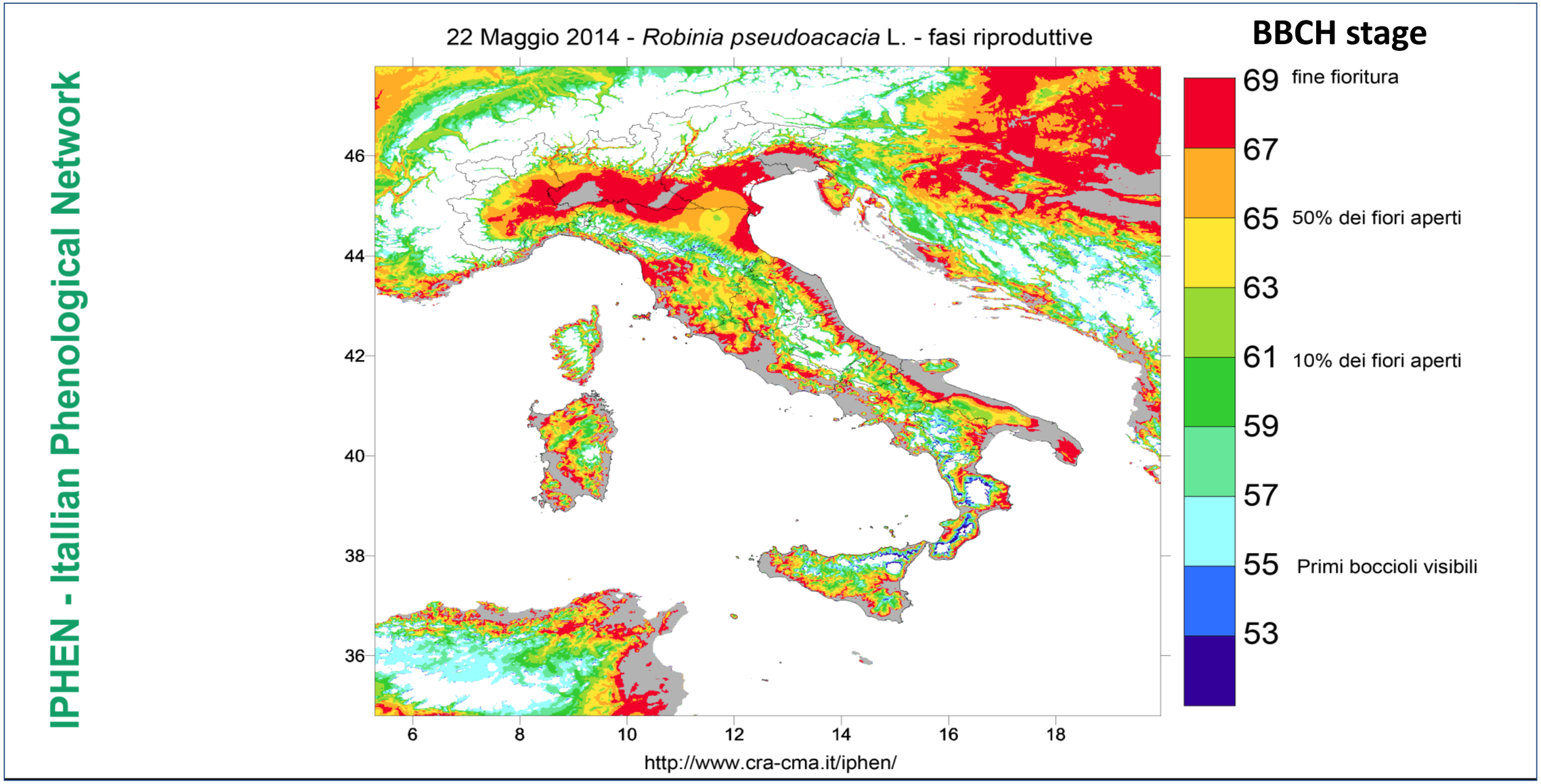
Salix caprea

Robinia pseudoacacia



Hedera helix

Iphen – Predictive models



Ivy: is it real resource?

The case of 30 nucs starved in spite of their huge honey stores

AUTUMN: forest with an unexpected nectar flow

LATE AUTUMN: transhumance to a well exposed area

SPRING: bees found starved on combs well provided with honey

Ivy is not for honey bees

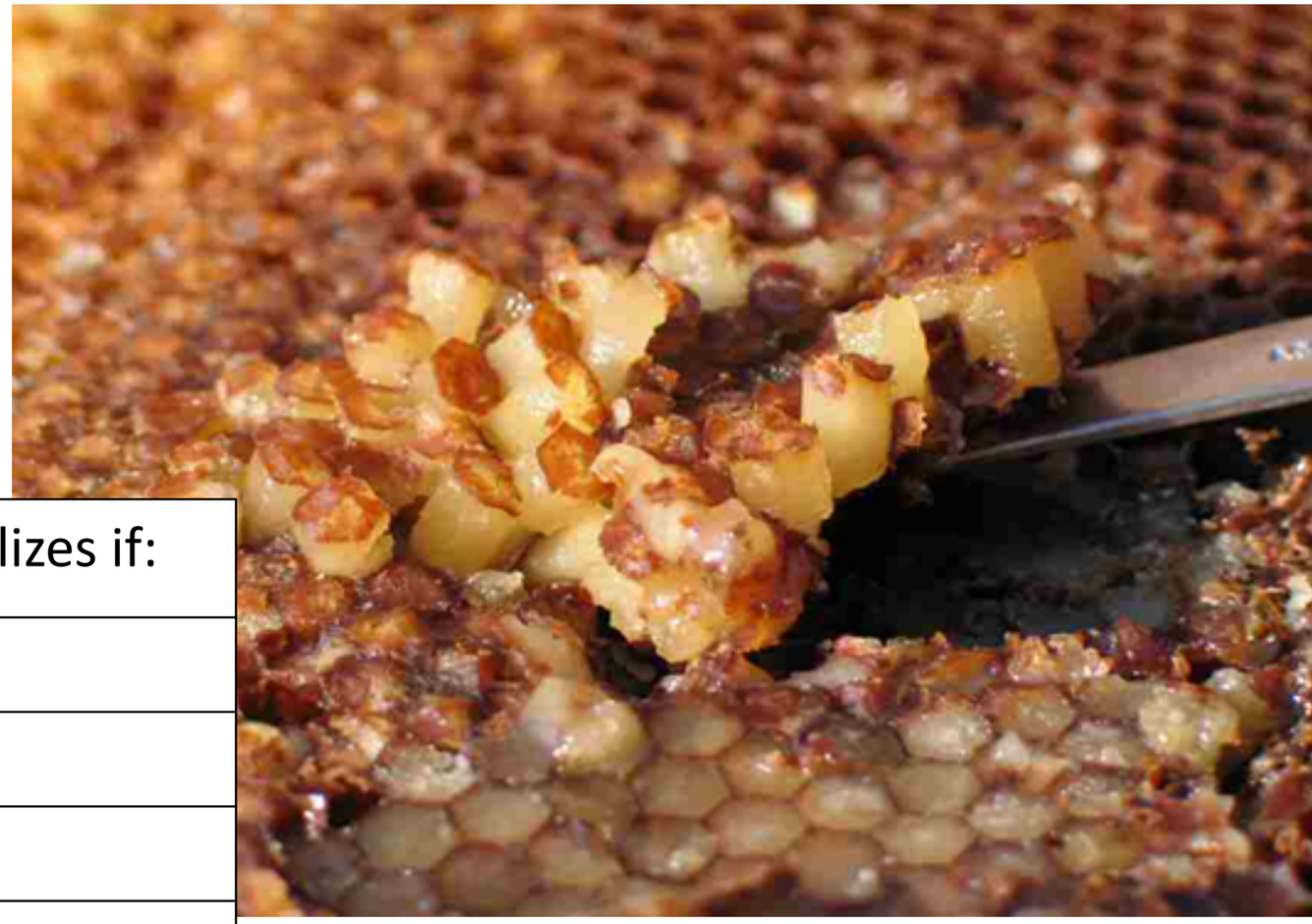
Crystallized nectar

Foto: http://urbanpollinators.blogspot.com/2013/10/ivy-hedera-spp-important-food-source.html

Foto: http://urbanpollinators.blogspot.com/2013/10/ivy-hedera-spp-important-food-source.html

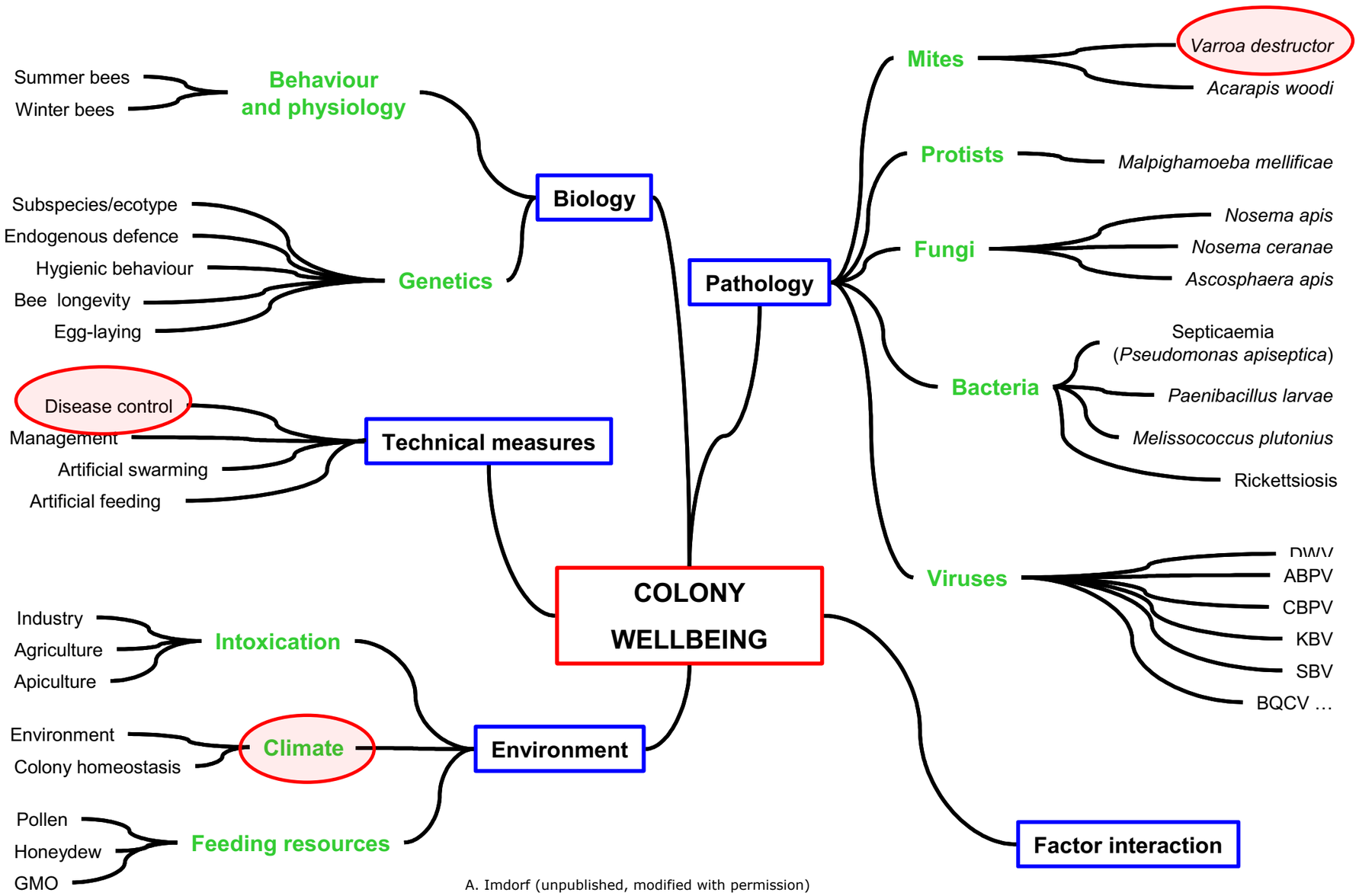
Combs with unusable ivy combs

Foto: http://urbanpollinators.blogspot.com/2013/10/ivy-hedera-spp-important-food-source.html



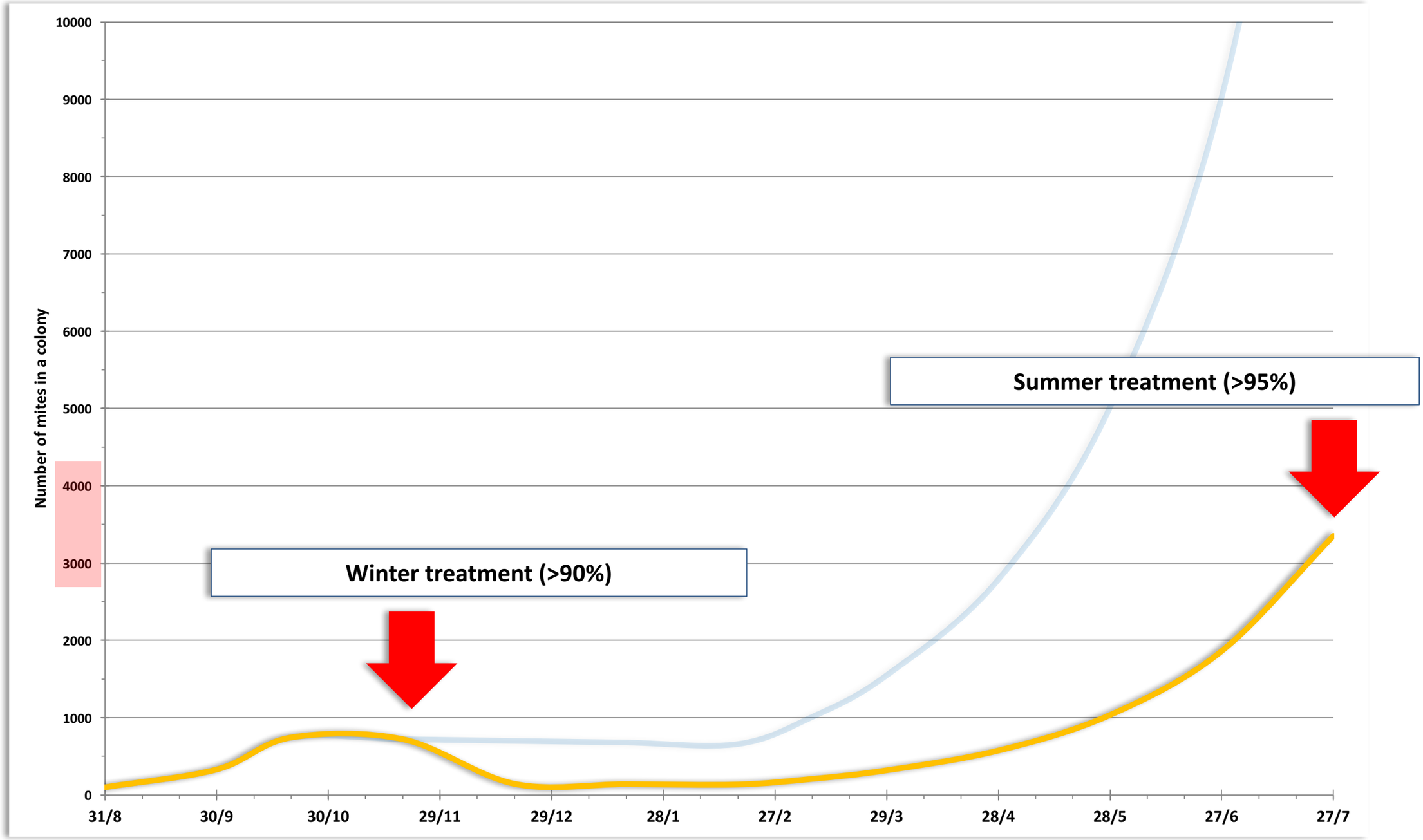
Ivy honey		Crystallizes if:
Water	17.3%	
Glucose	45.7%	
Fructose	36.6%	
Fructose/Glucose	0.8	<1.2
Glucose/water	2.6	>2

Factors of colony wellbeing

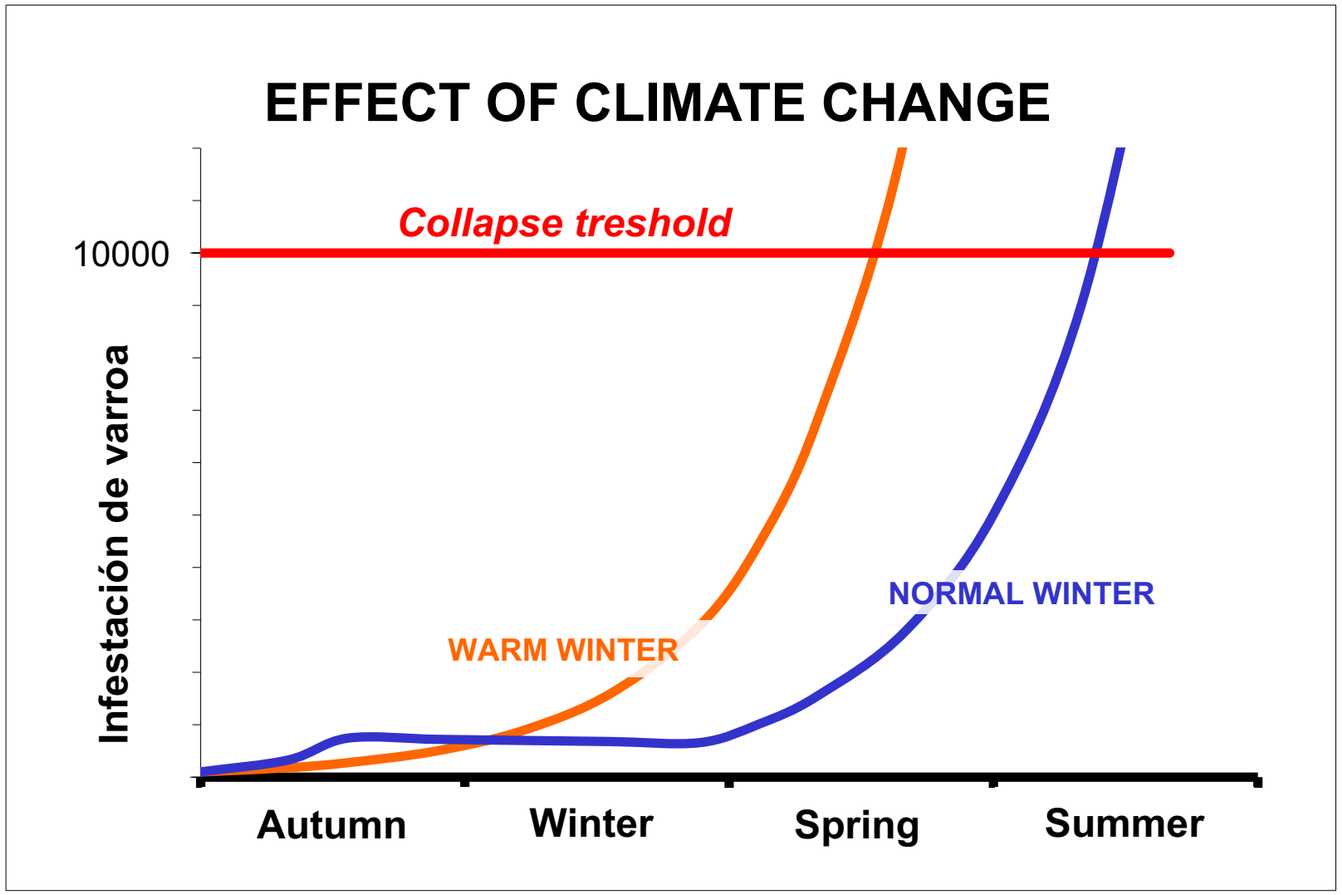


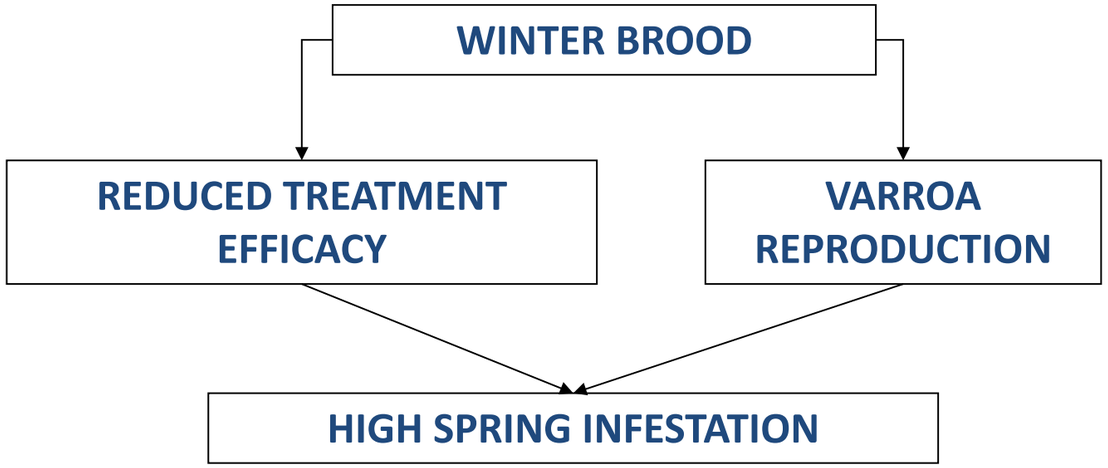
A. Imdorf (unpublished, modified with permission)

Varroa control strategy



A new relationship between varroa and bees





How to cope with the problem?

Mitigation

CLIMATE POLICY

A roadmap for rapid decarbonization

Emissions inevitably approach zero with a "carbon law"

By **Johan Rockström,[1] Owen Gaffney,[1,2] Joeri Rogelj,[3,4] Malte Meinshausen,[5,6] Nebojsa Nakicenovic,[3] Hans Joachim Schellnhuber[1,5]**

Science 24 Mar 2017:
Vol. 355, Issue 6331, pp. 1269-1271.
DOI: 10.1126/science.aah3443

Adaptation

Reduce the vulnerability of the systems affected by the climate change with technical, investigation and information etc. measures.

In our case: new varroa control strategy to solve the problem of winter brood:

1) **WINTER QUEEN CAGING**
2) **SHIFT TREATMENTS TO OTHER SEASONS**

Partially financed by:

Regione Emilia-Romagna

Reg. (CE) 1308/2013 - Misura F, Azione F2

1) Winter queen caging

Experimental design

- 4 groups (N=15)
  - A: short caging (23 dd)
  - B: middle caging (76 dd)
  - C: long caging (93 dd)
  - N: uncaged queen (control)
- Colony measurement PRE and POST-winter
- Queen status PRE and POST-winter
- Varroa counts

Caging groups A, B and C

23/11/2016:
Colonies were naturally broodless.
Queens were caged in the centre of the cluster.

Colour pins corresponding to the cages. Cages were repeatedly moved on the need to keep them within the cluster.

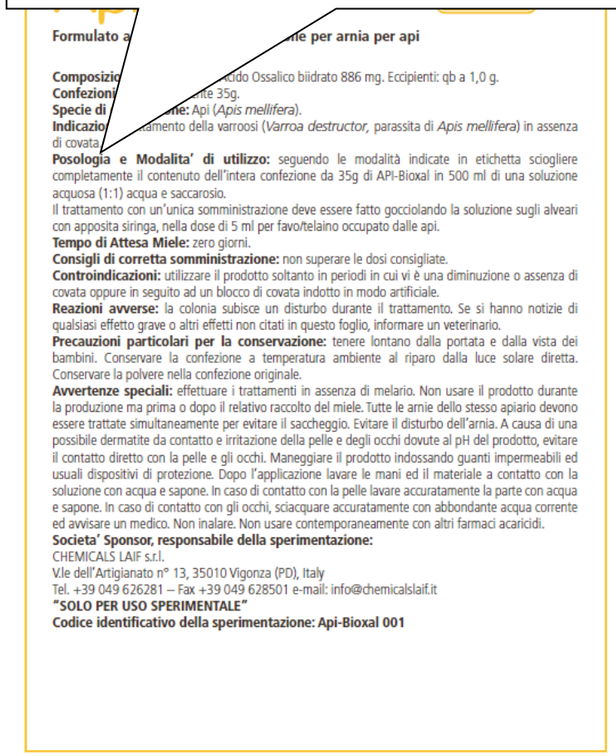
Treatment with Api-Bioxal

16/12/2016:
Queen set free in group A. Trickling administration of ApiBioxal to all colonies.

Solution preparation

- [AO]: 4,2%
- [Sucrose]: 60%

Dissolve 35 g in 500 ml sugar water 1:1



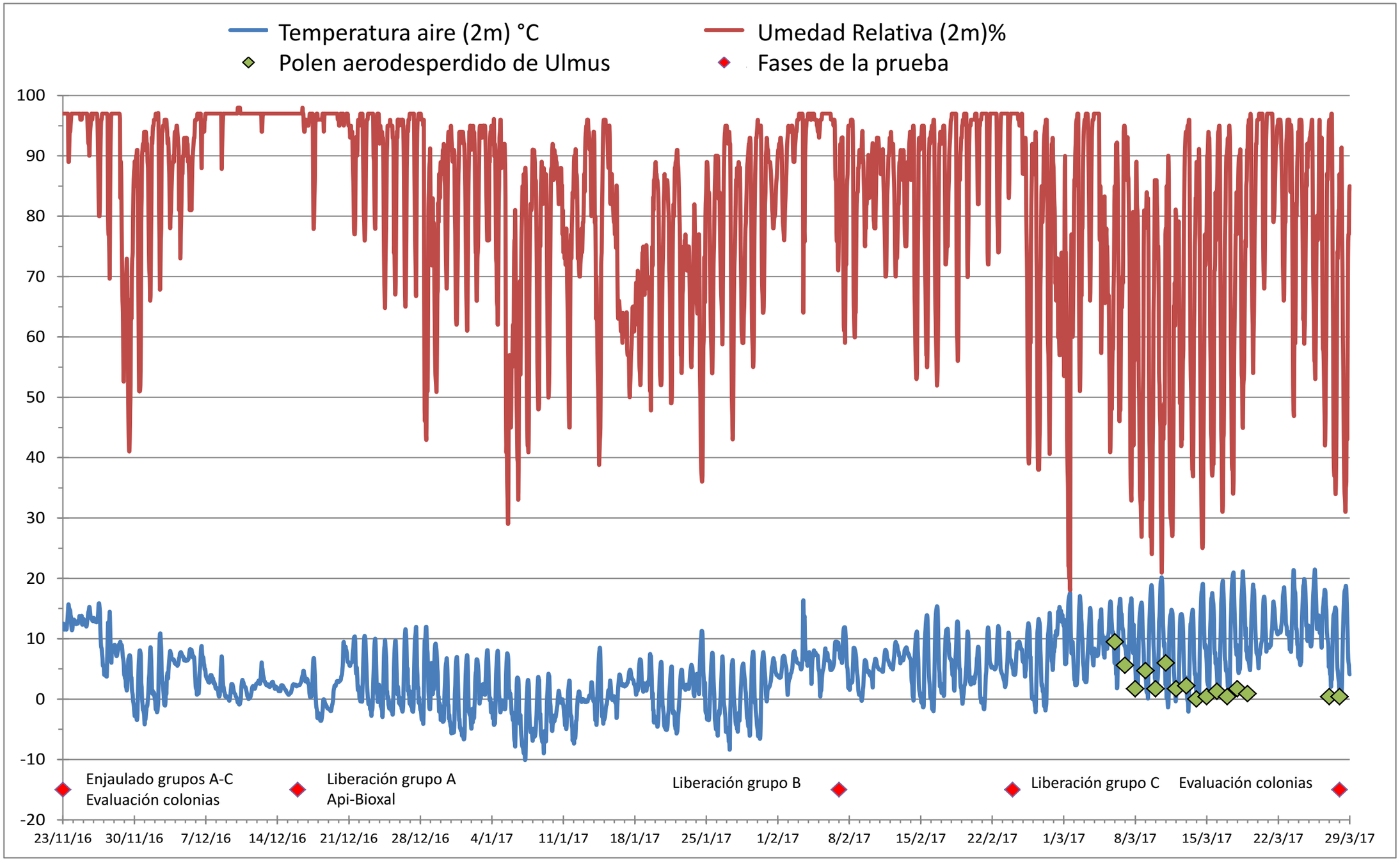
Formulato a **ne per arnia per api**

Composizio ido Ossalico biidrato 886 mg. Eccipienti: qb a 1,0 g.
Confezioni te 35g.
Specie di **ne:** Api (*Apis mellifera*).
Indicazio amento della varroosi (*Varroa destructor*, parassita di *Apis mellifera*) in assenza di covata.
Posologia e Modalita' di utilizzo: seguendo le modalità indicate in etichetta sciogliere completamente il contenuto dell'intera confezione da 35g di API-Bioxal in 500 ml di una soluzione acquosa (1:1) acqua e saccarosio.
Il trattamento con un'unica somministrazione deve essere fatto gocciolando la soluzione sugli alveari con apposita siringa, nella dose di 5 ml per favo/telaino occupato dalle api.
Tempo di Attesa Miele: zero giorni.
Consigli di corretta somministrazione: non superare le dosi consigliate.
Controindicazioni: utilizzare il prodotto soltanto in periodi in cui vi è una diminuzione o assenza di covata oppure in seguito ad un blocco di covata indotto in modo artificiale.
Reazioni avverse: la colonia subisce un disturbo durante il trattamento. Se si hanno notizie di qualsiasi effetto grave o altri effetti non citati in questo foglio, informare un veterinario.
Precauzioni particolari per la conservazione: tenere lontano dalla portata e dalla vista dei bambini. Conservare la confezione a temperatura ambiente al riparo dalla luce solare diretta. Conservare la polvere nella confezione originale.
Avvertenze speciali: effettuare i trattamenti in assenza di melario. Non usare il prodotto durante la produzione ma prima o dopo il relativo raccolto del miele. Tutte le arnie dello stesso apiario devono essere trattate simultaneamente per evitare il saccheggio. Evitare il disturbo dell'arnia. A causa di una possibile dermatite da contatto e irritazione della pelle e degli occhi dovute al pH del prodotto, evitare il contatto diretto con la pelle e gli occhi. Maneggiare il prodotto indossando guanti impermeabili ed usuali dispositivi di protezione. Dopo l'applicazione lavare le mani ed il materiale a contatto con la soluzione con acqua e sapone. In caso di contatto con la pelle lavare accuratamente la parte con acqua e sapone. In caso di contatto con gli occhi, sciacquare accuratamente con abbondante acqua corrente ed avvisare un medico. Non inalare. Non usare contemporaneamente con altri farmaci acaricidi.
Societa' Sponsor, responsabile della sperimentazione:
CHEMICALS LAIF s.r.l.
V.le dell'Artigianato n° 13, 35010 Vigonza (PD), Italy
Tel. +39 049 626281 – Fax +39 049 628501 e-mail: info@chemicalslaif.it
"SOLO PER USO SPERIMENTALE"
Codice identificativo della sperimentazione: Api-Bioxal 001

Administration by trickling

- Dose: 5 ml/comb with bees

Environmental situation



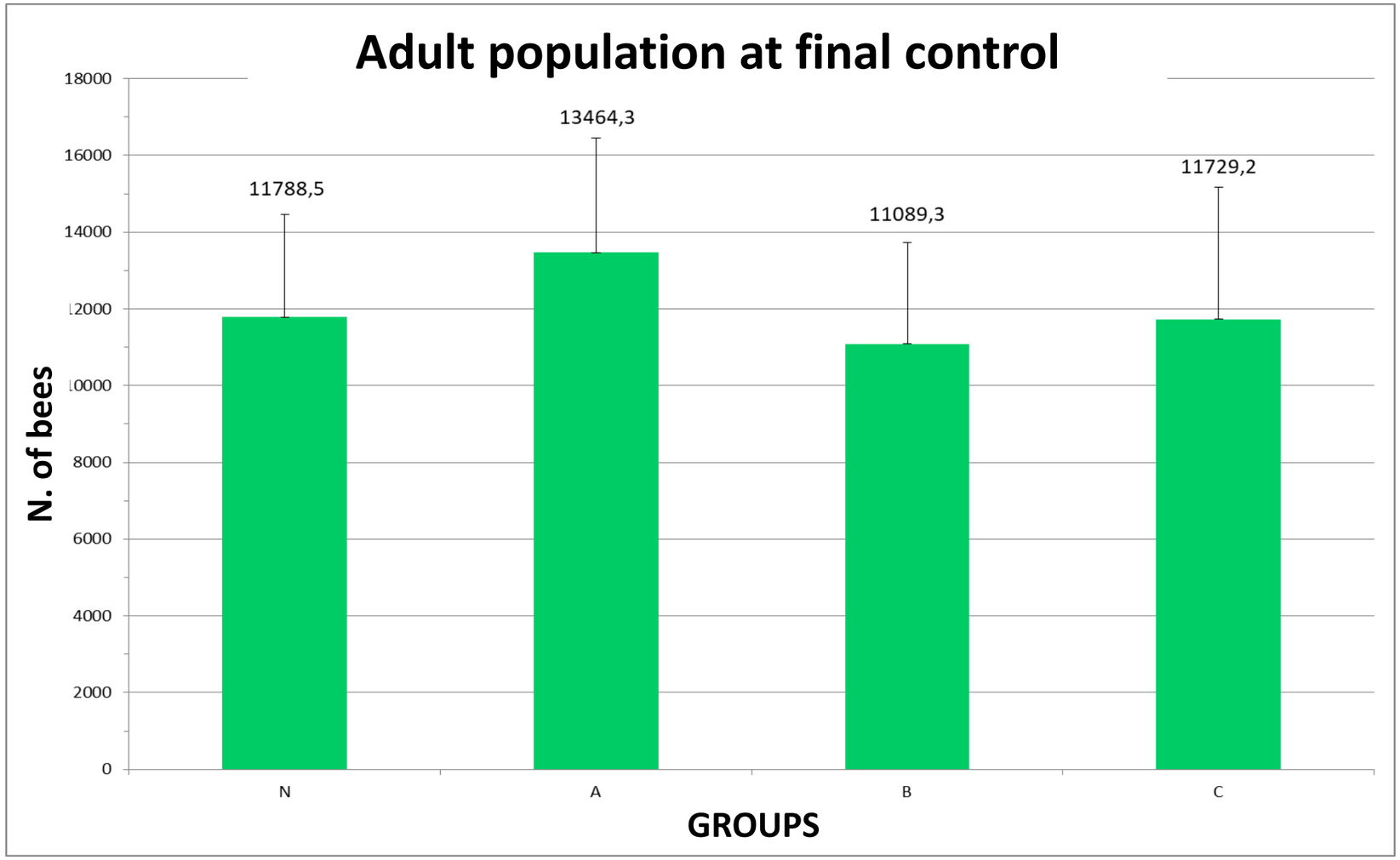
Effect on queen survival

Three queens dead for external reasons:
- 2 lost during checks (19N, 33N)
- 1 cataleptic (18C)

Group	Caging duration (dd)	Alive		Dead*		Total
N	0	13	100,0%	0	0,0%	13
A	23	14	93,3%	1	6,7%	15
B	79	14	93,3%	1	6,7%	15
C	93	12	85,7%	2	14,3%	14
Total	-	53	93,0%	4	7,0%	**57**

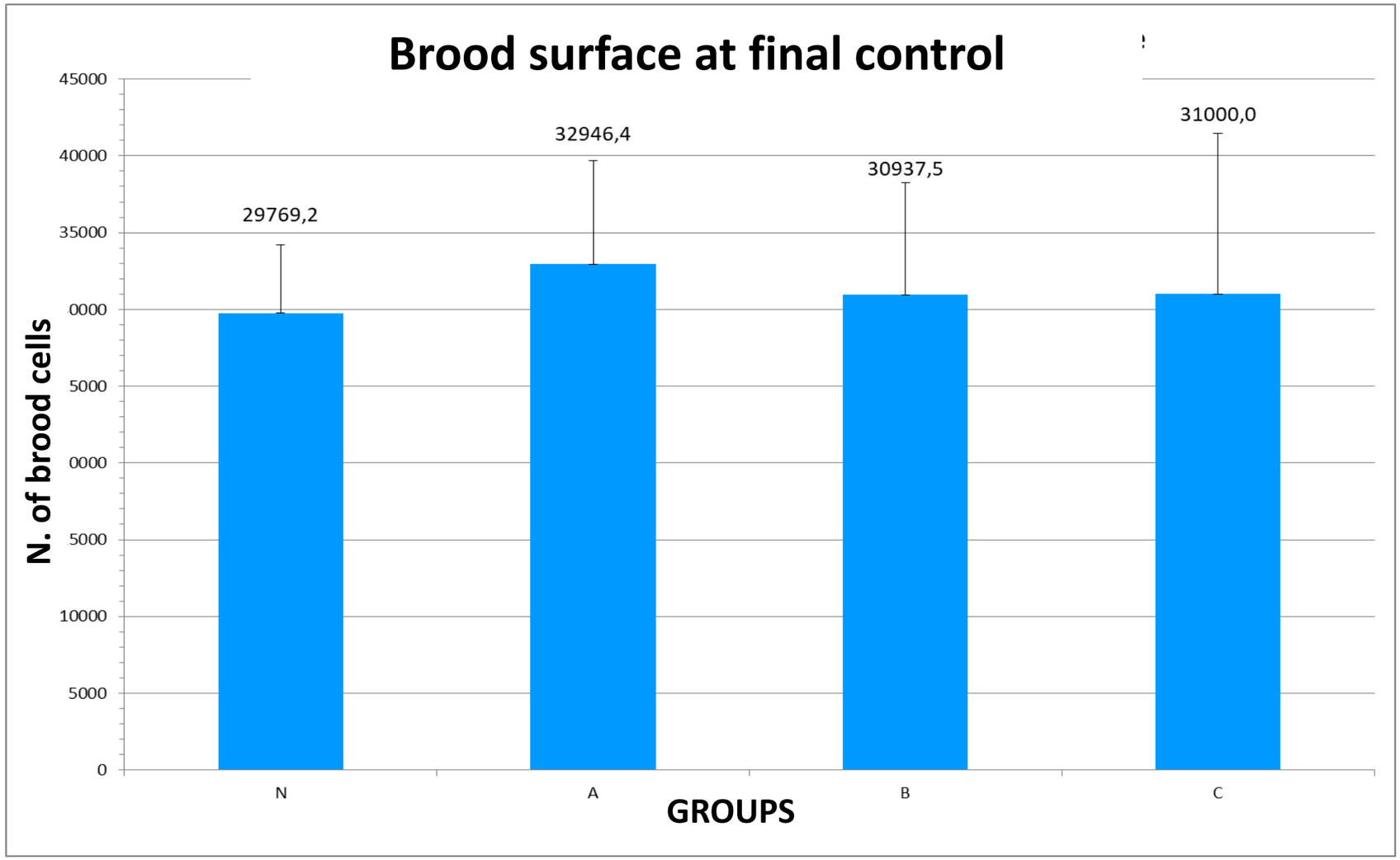
* Mortality not significantly different
(Test Chi2 (3, N=57) = 2,12; p = 0,549)

Post-winter colony strength



Not significantly different
(Test Kruskal-Wallis: H(3, N= 53)= 5,398 p = 0,145)

Post-winter brood



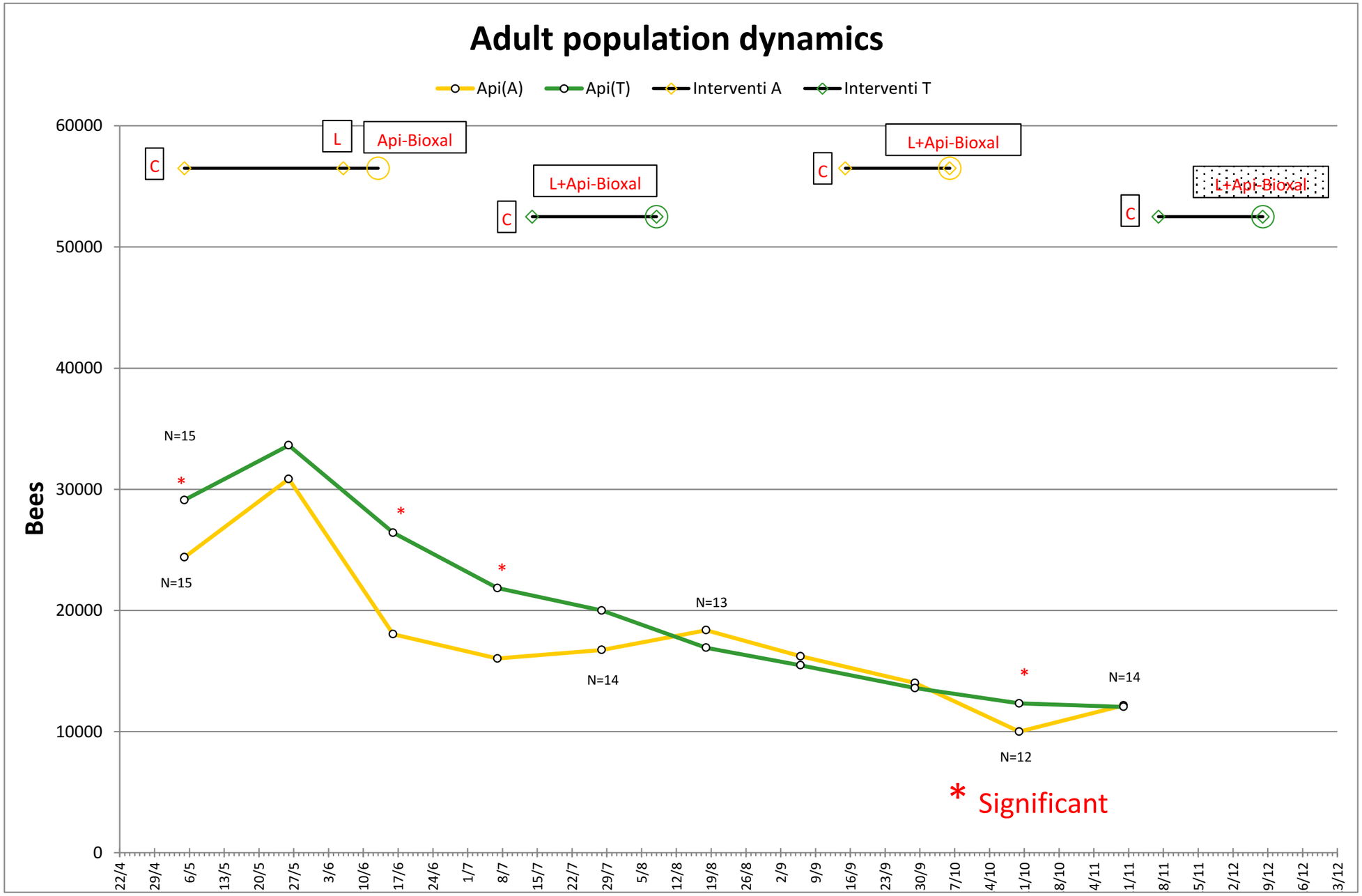
Not significantly different
(Test Kruskal-Wallis: H(3, N= 53)= 0,809 p = 0,847)

2) Shift of treatment period

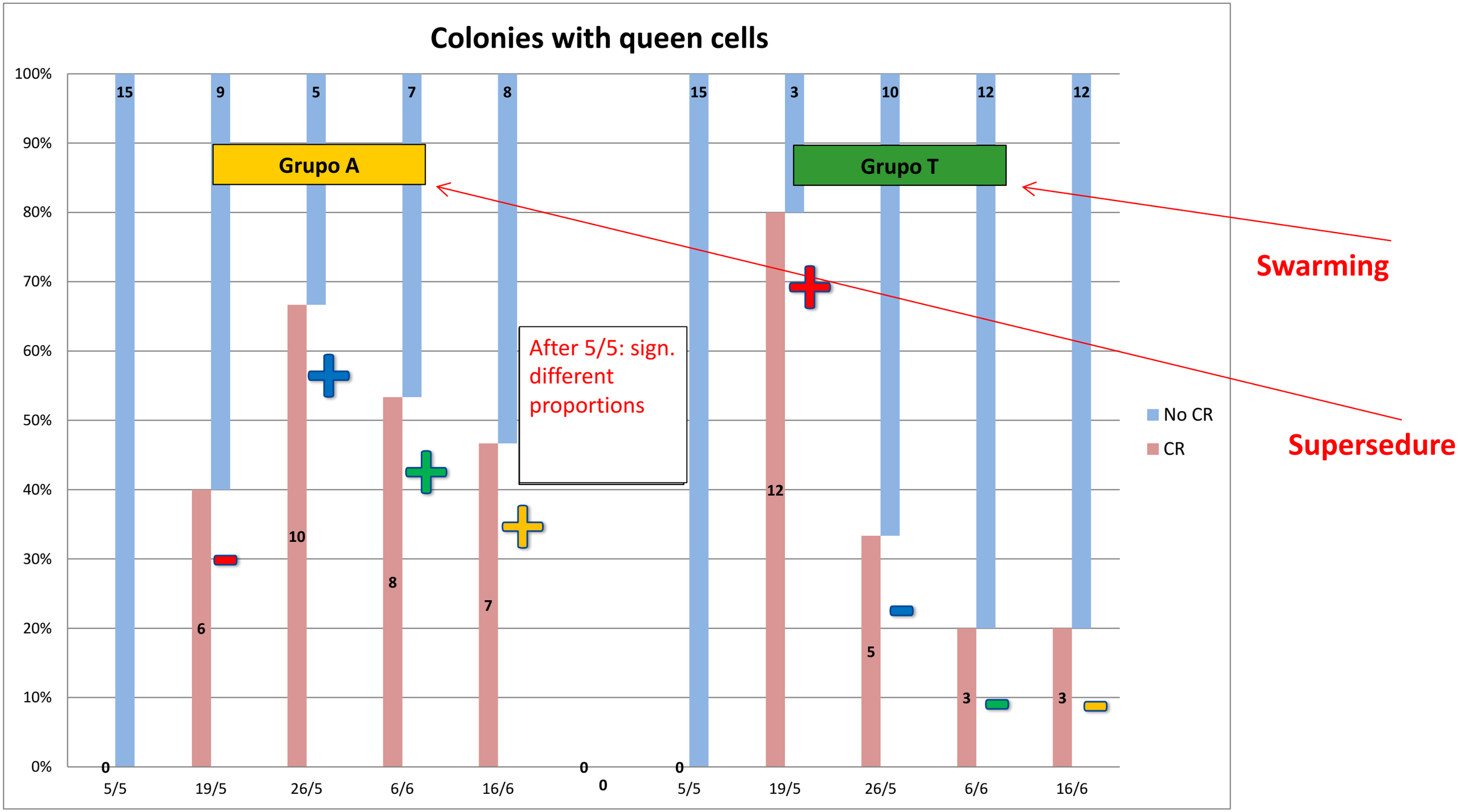
Experimental design

- 2 grups (N=15)
  - **T**: **Traditional** strategy (treatments in winter and summer)
  - **A**: **Alternative** strategy (treatments in spring and autumn)
- Treatments with:
  - Caging of the queen
  - Api-Bioxal (trickling, 5 ml/comb with bees)
- Checks
  - Varroa (weekly)
  - Swarming (weekly in the critical period)
  - Colony strength (every third week)
  - Honey (when harvested)

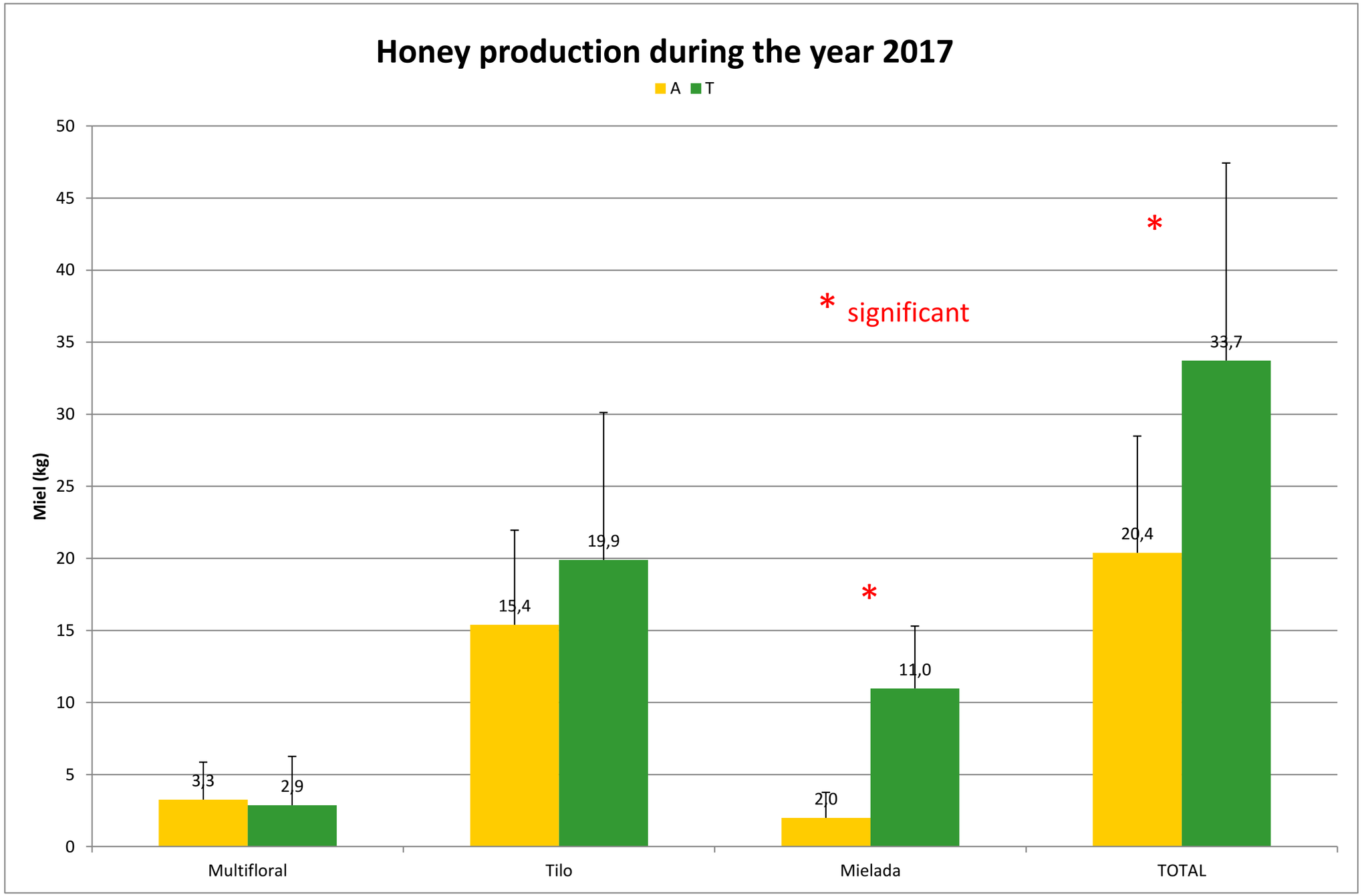
Colony development



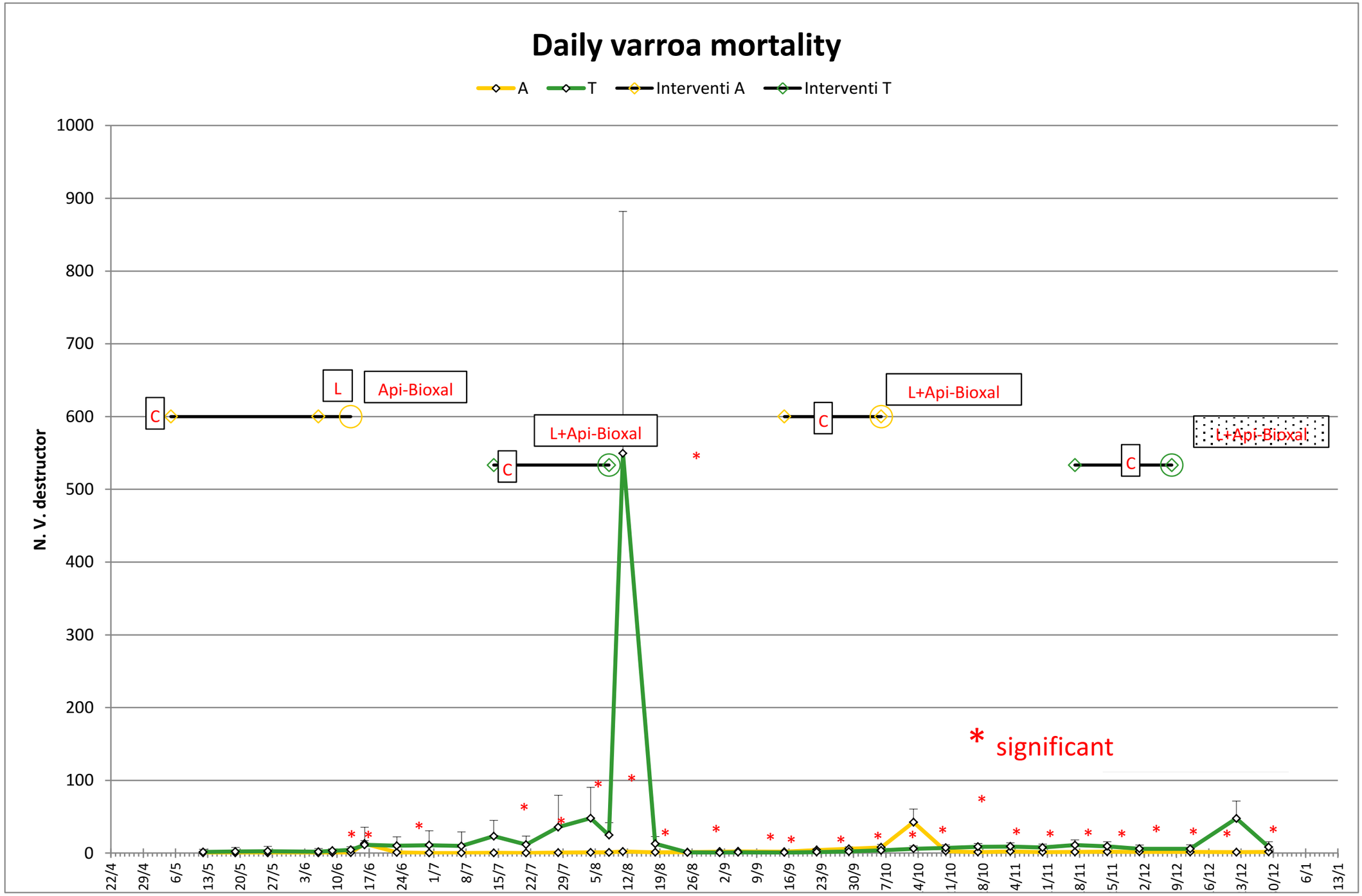
Swarming tendency



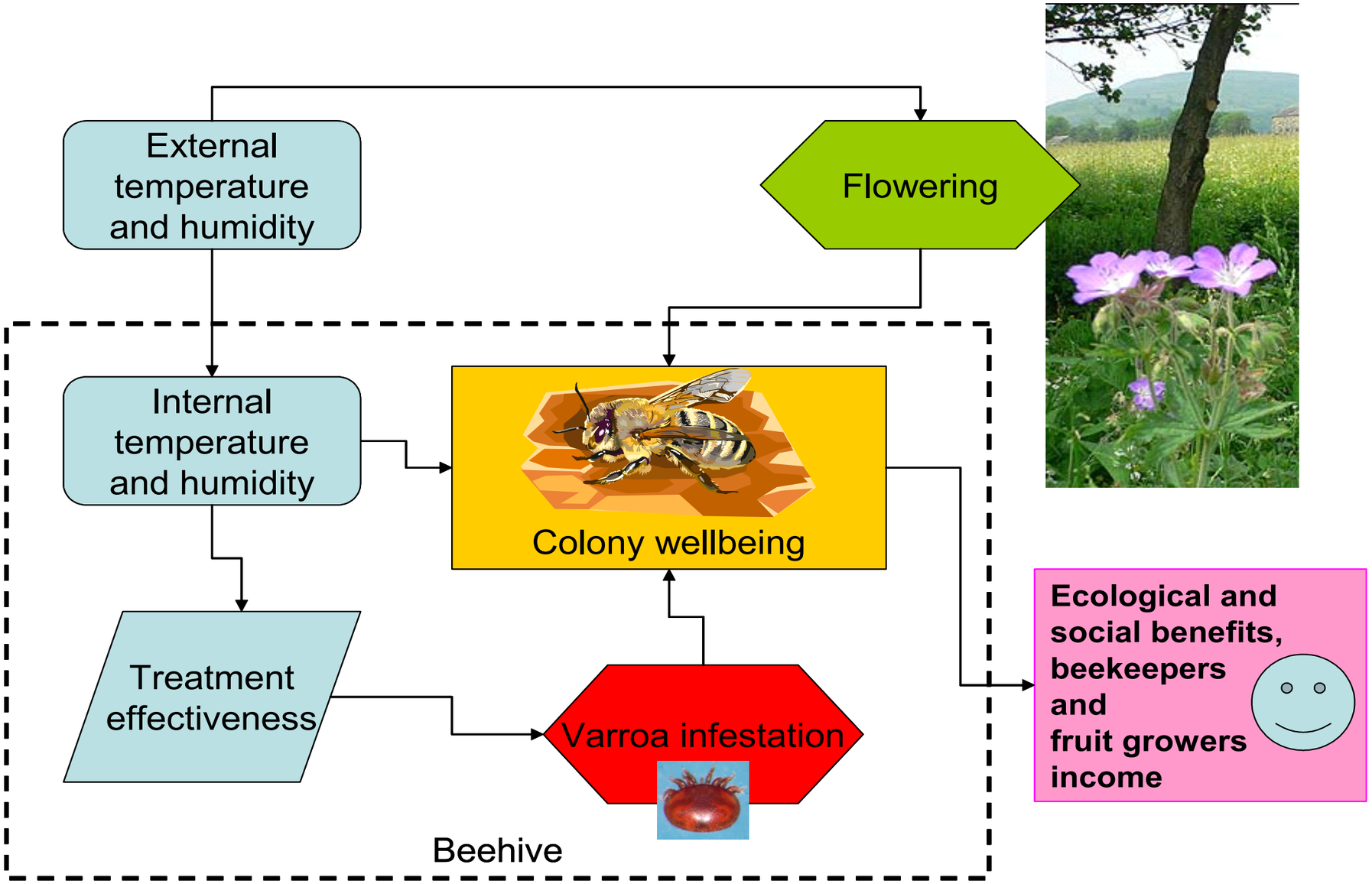
Honey production

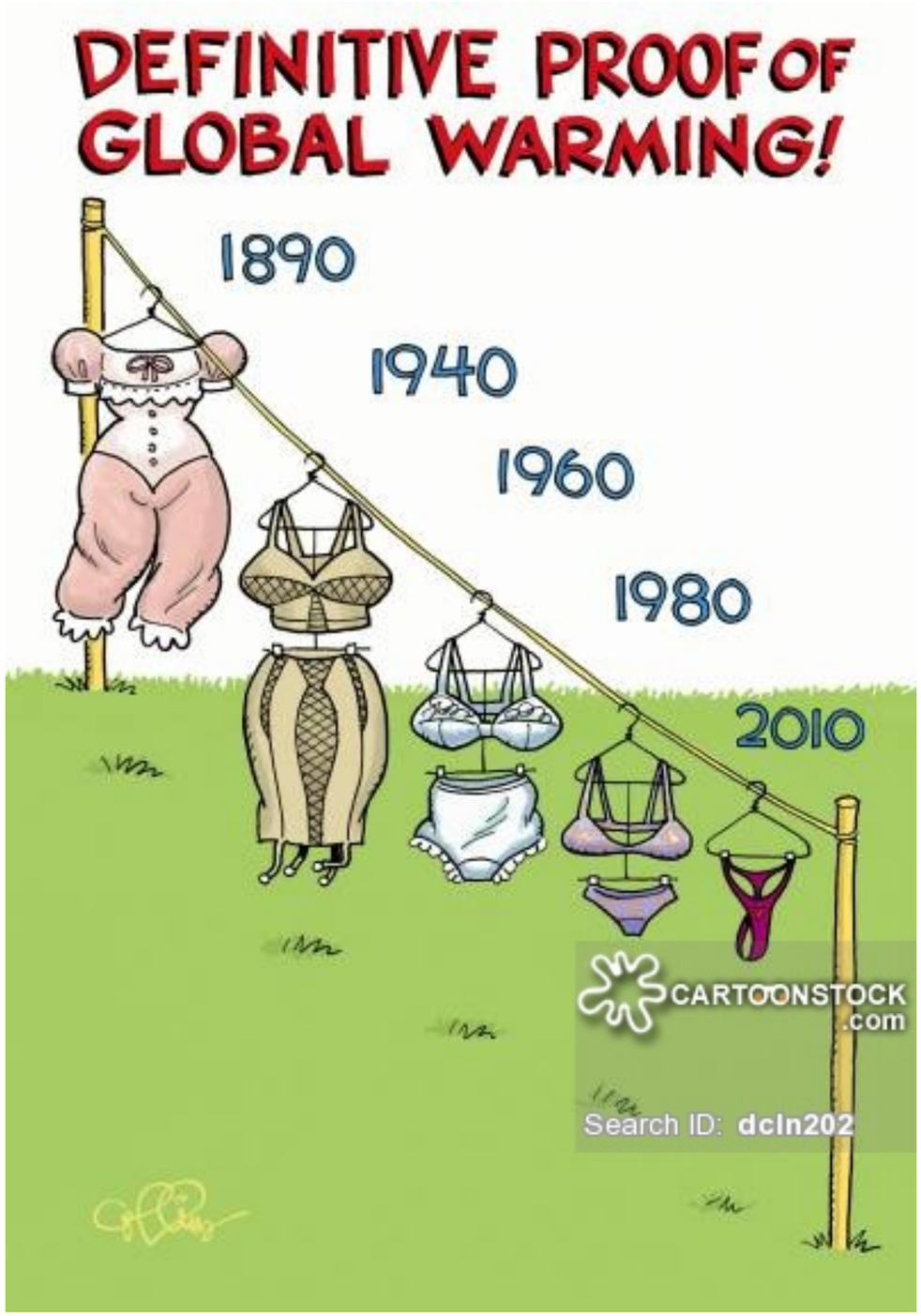


Varroa mortality



Conceptual model climate effects on colony wellbeing





Thanks for your attention

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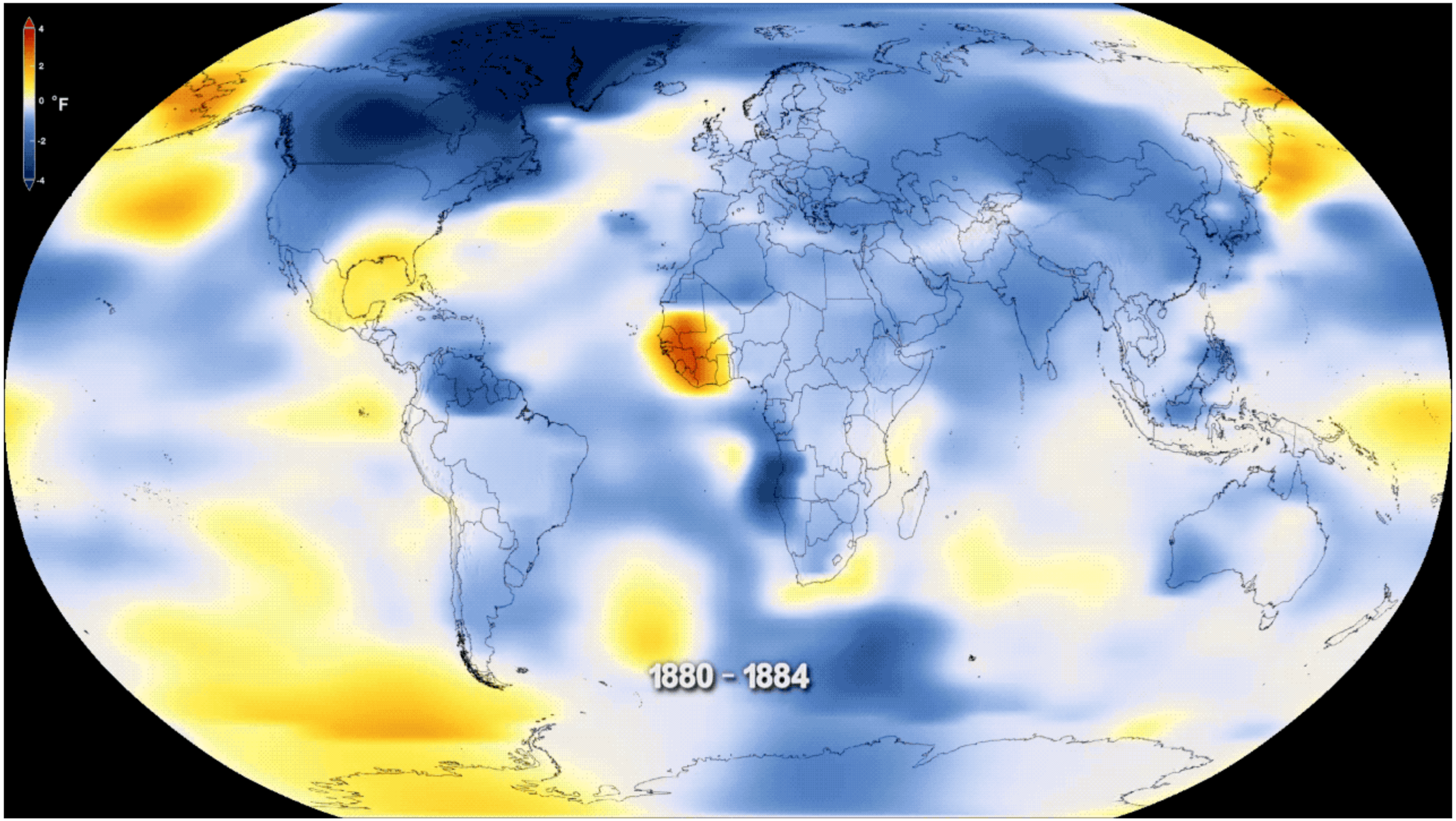

https://climate.nasa.gov/climate_resources/139/graphic-global-warming-from-1880-to-2017/