

Does the release of Bonelli's Eagles from Captive Breeding Contribute to Population Rehabilitation? (and dispersal patterns of the Israeli wild population)



Israel Electric

The Bonelli's Eagle in Israel

- **Critically endangered** species with about 20 breeding pairs (at least 60 pairs in the past)

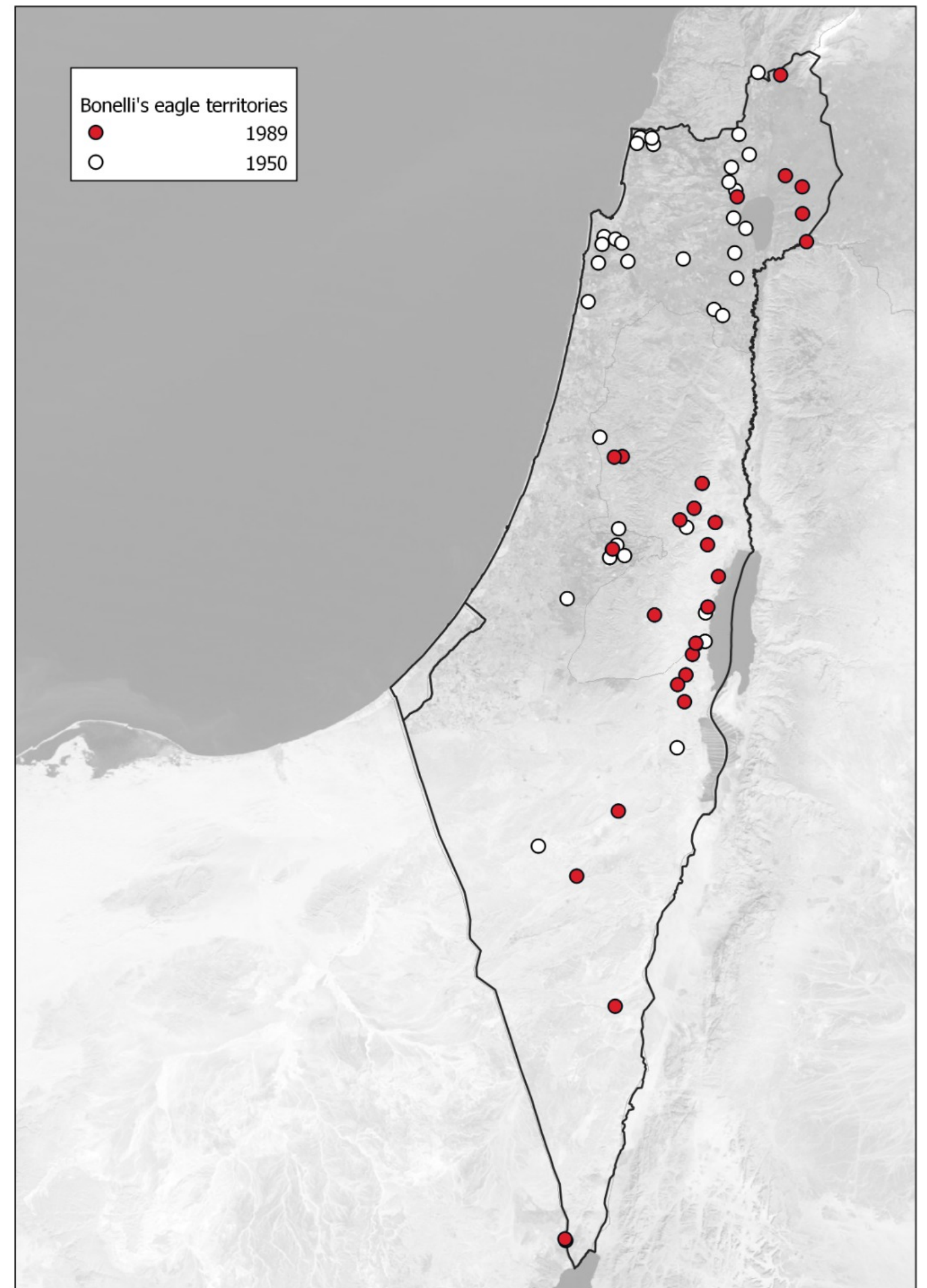
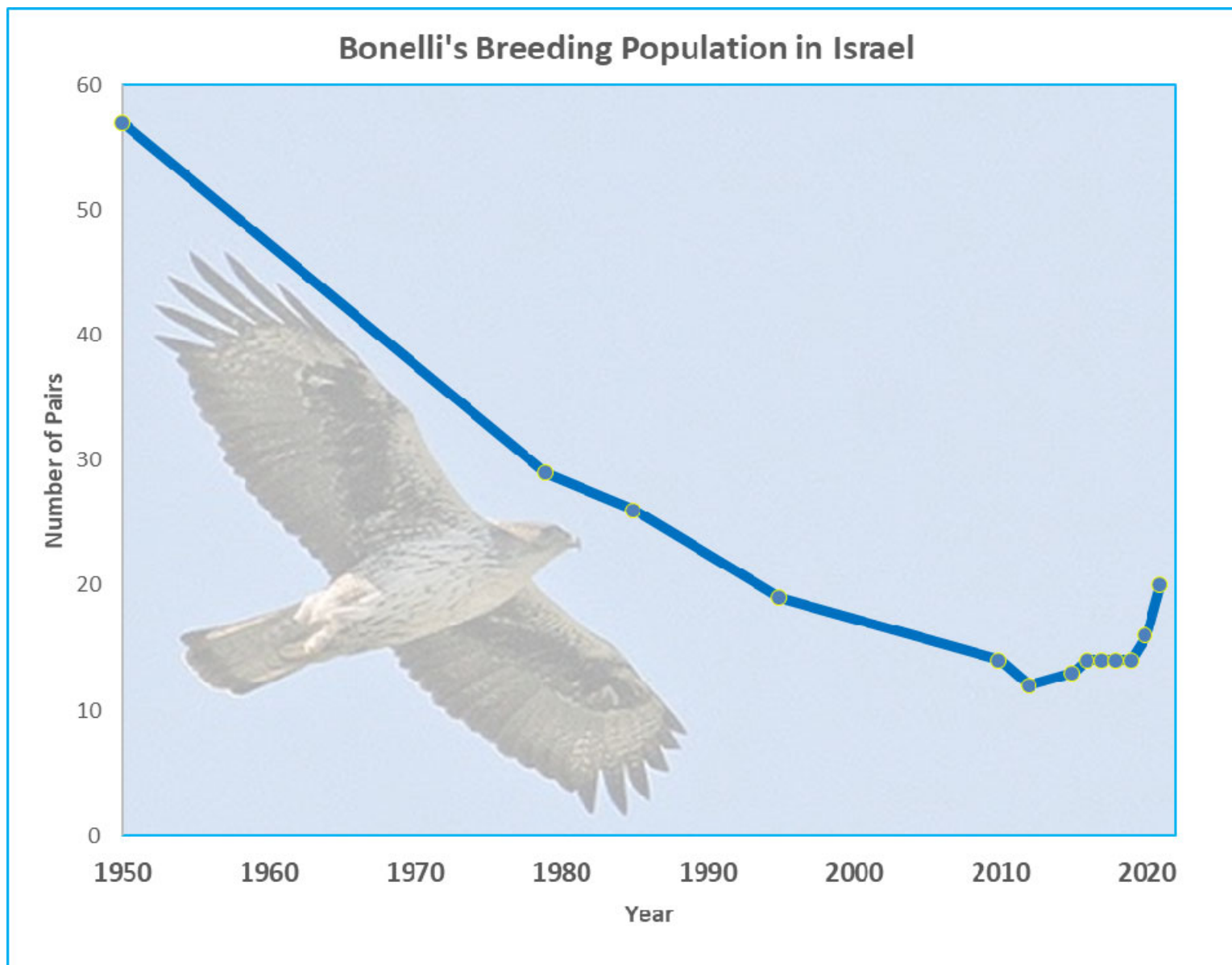
Among the Conservation measures:

- 1. Intensive monitoring** of the wild breeding population
- 2. Nest guarding** at high-risk areas for nest harvesting
- 3. Disturbances prevention** (aerial activity/climbers etc.)
- 4. Rehabilitation** of injured Eagles
- 5. Nesting interventions** whenever necessary (very often Trichomonas treatment)
- 6. Captive breeding** and release



The motivation for the reinforcement program

During the 1950s and the 1960s the population decimated due to agricultural pesticides from about 60 pairs to less than 30.



Hai-Bar Carmel Nature Reserve Raptor Breeding & Rehabilitation Center

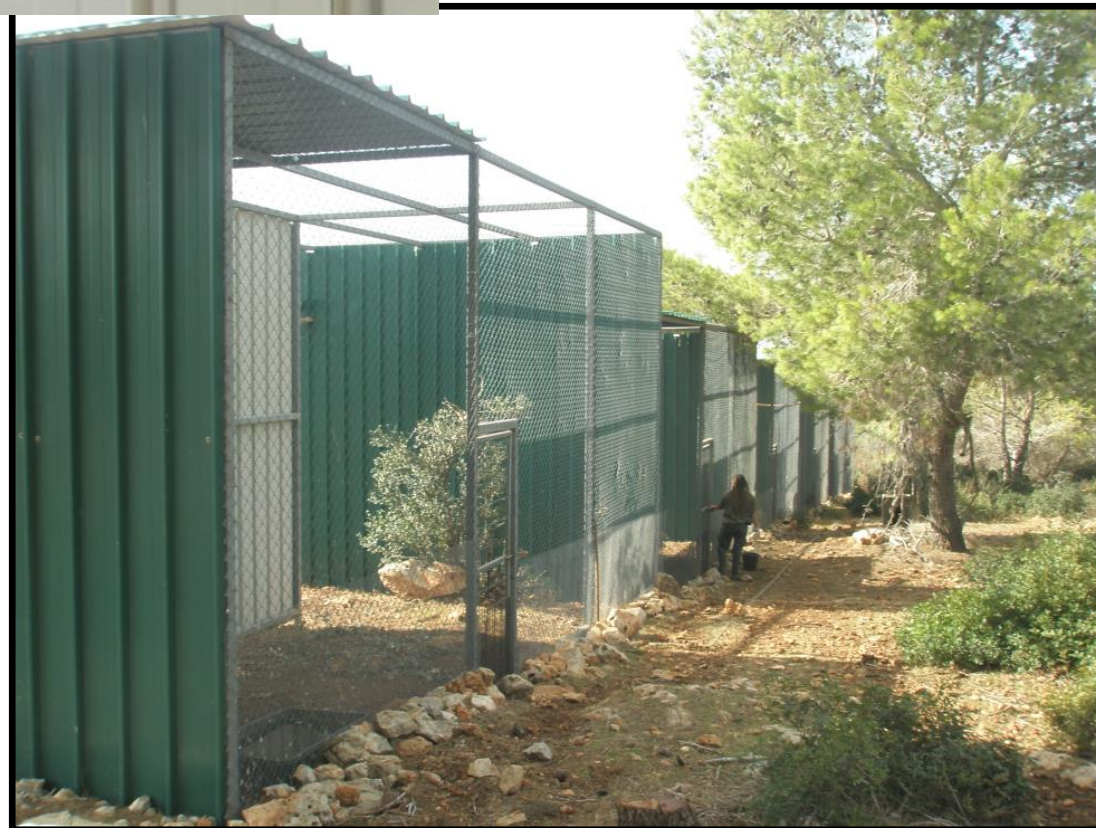
Breeding center for 7 endangered species,

Among them: Bonelli's Eagle, Griffon Vulture, Egyptian Vulture & Lanner Falcon.



Breeding & Rehabilitation cages

- The cages: built in a quiet and isolated area



Captive breeding of the Bonelli's Eagle

- **Source of breeding pairs:** Most of them are individuals that survived electrocution but lost the ability to fly and thus were brought to the breeding center.
- There are currently 8 pairs.
- Most of the nestlings being raised by their biological parents
- Eaglets fledge in their natal cages and then being transferred to the release pan



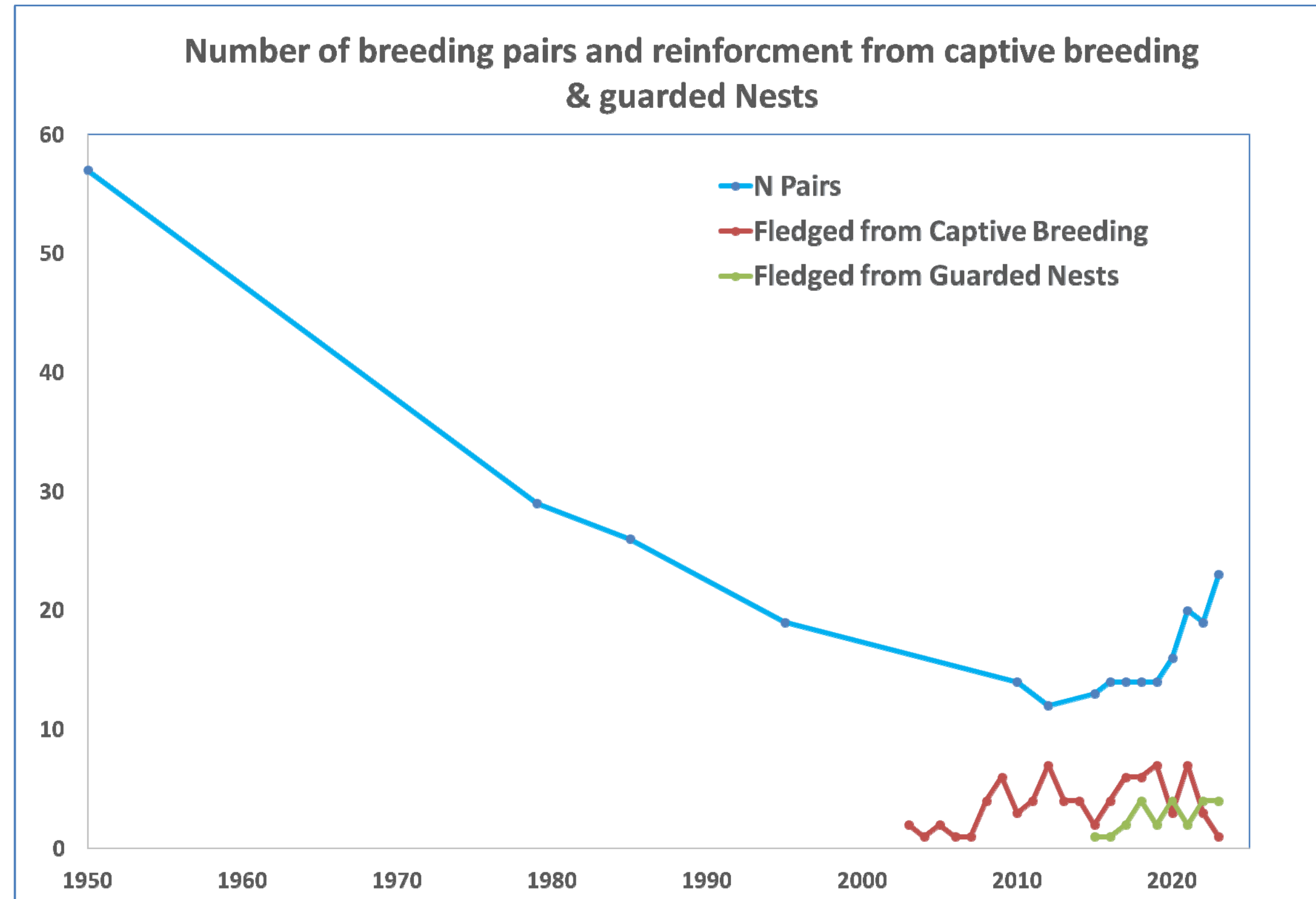
Two release sites

- Hi-Bar Carmel breeding center, near their parents
- Meshushim Nature Reserve in the Golan Heights



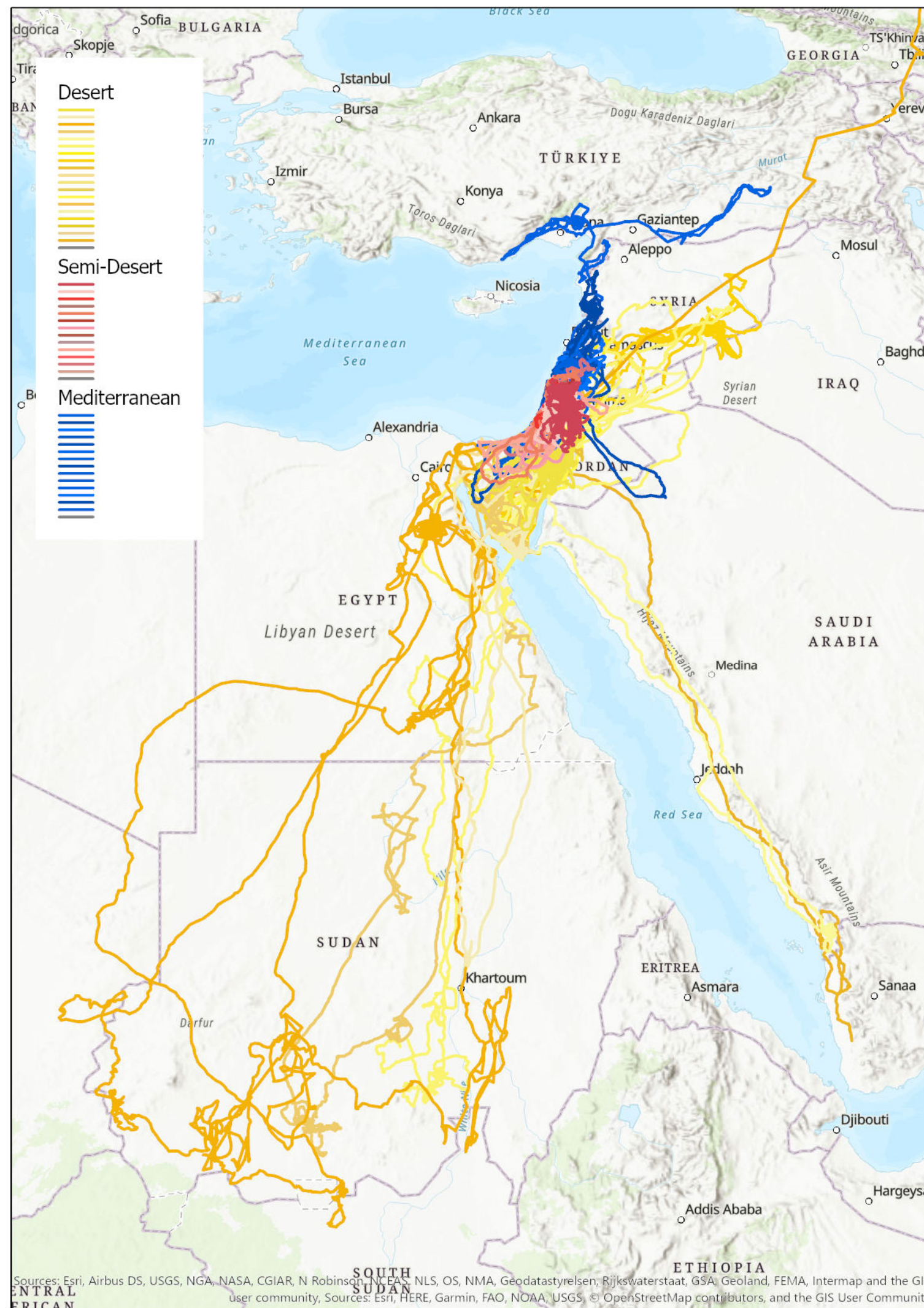
Does the release from captive breeding contribute to the wild population?

- Very few indications for the recruitment of captive bred individuals
- Impossible to separate the contribution of the captive breeding from other management measures (i.e. nest guarding, prevention of disturbances, nesting interventions etc.)

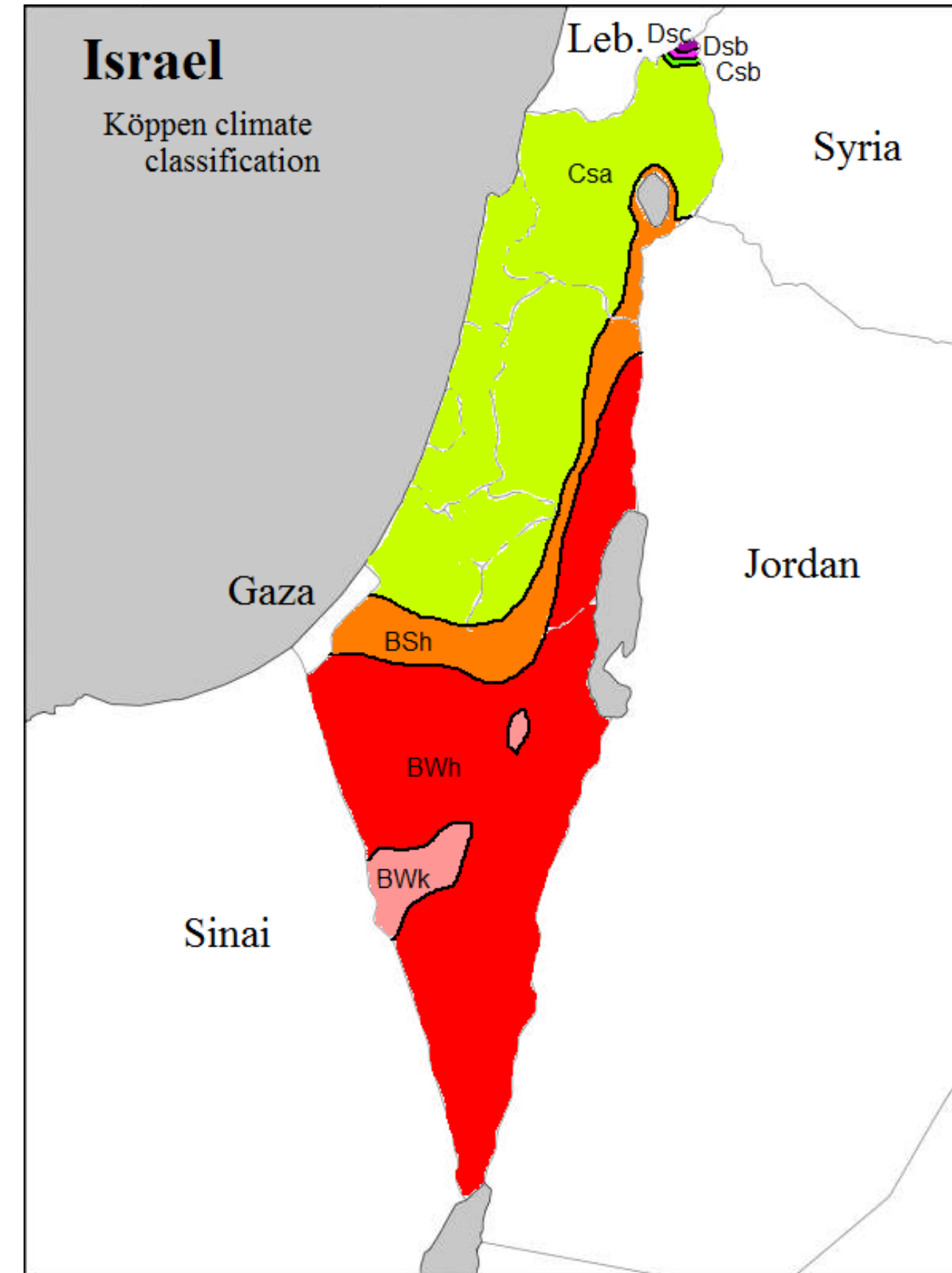


Dispersal Patterns

Nature born eagles
2017 – 2022 (N=46)



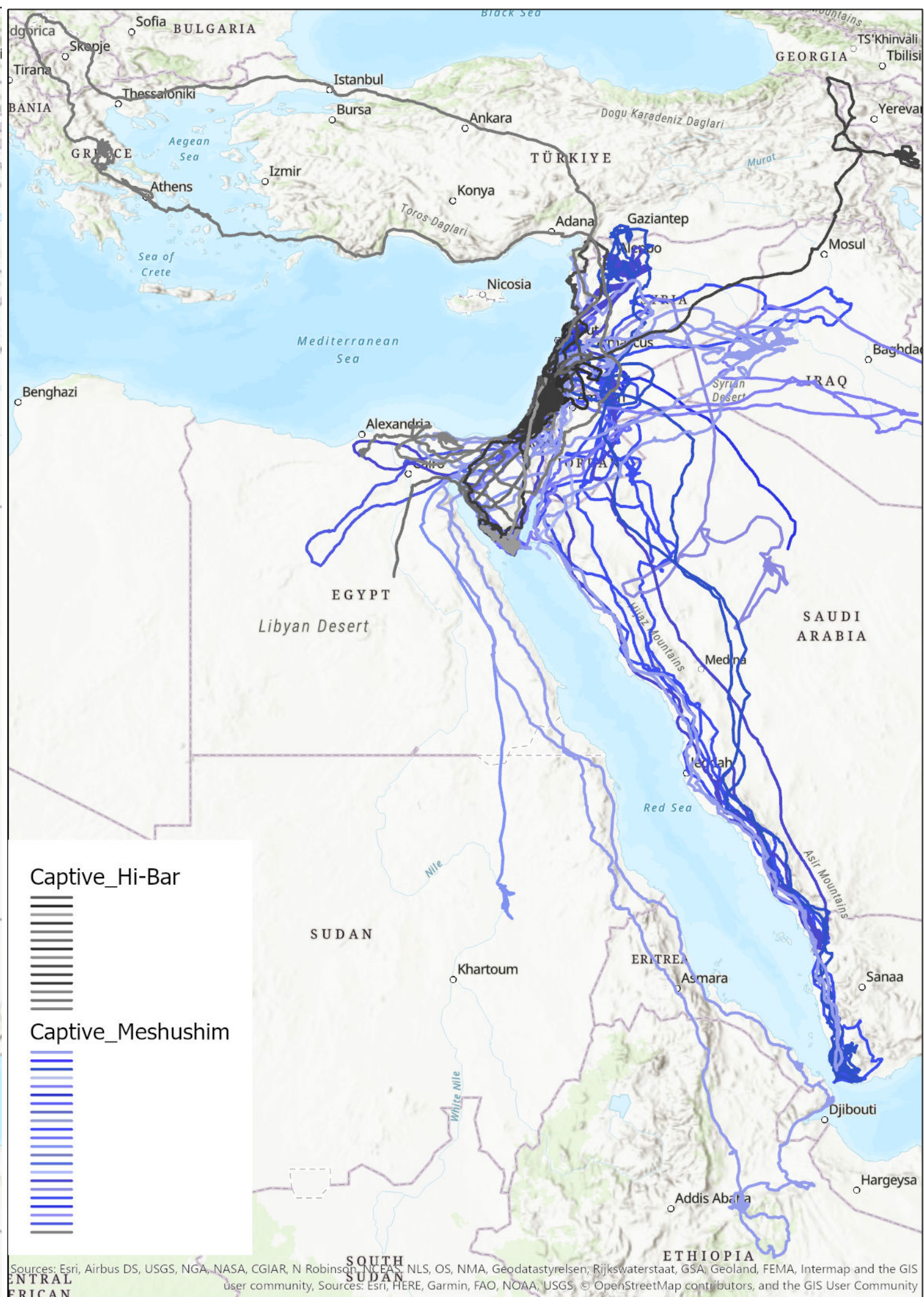
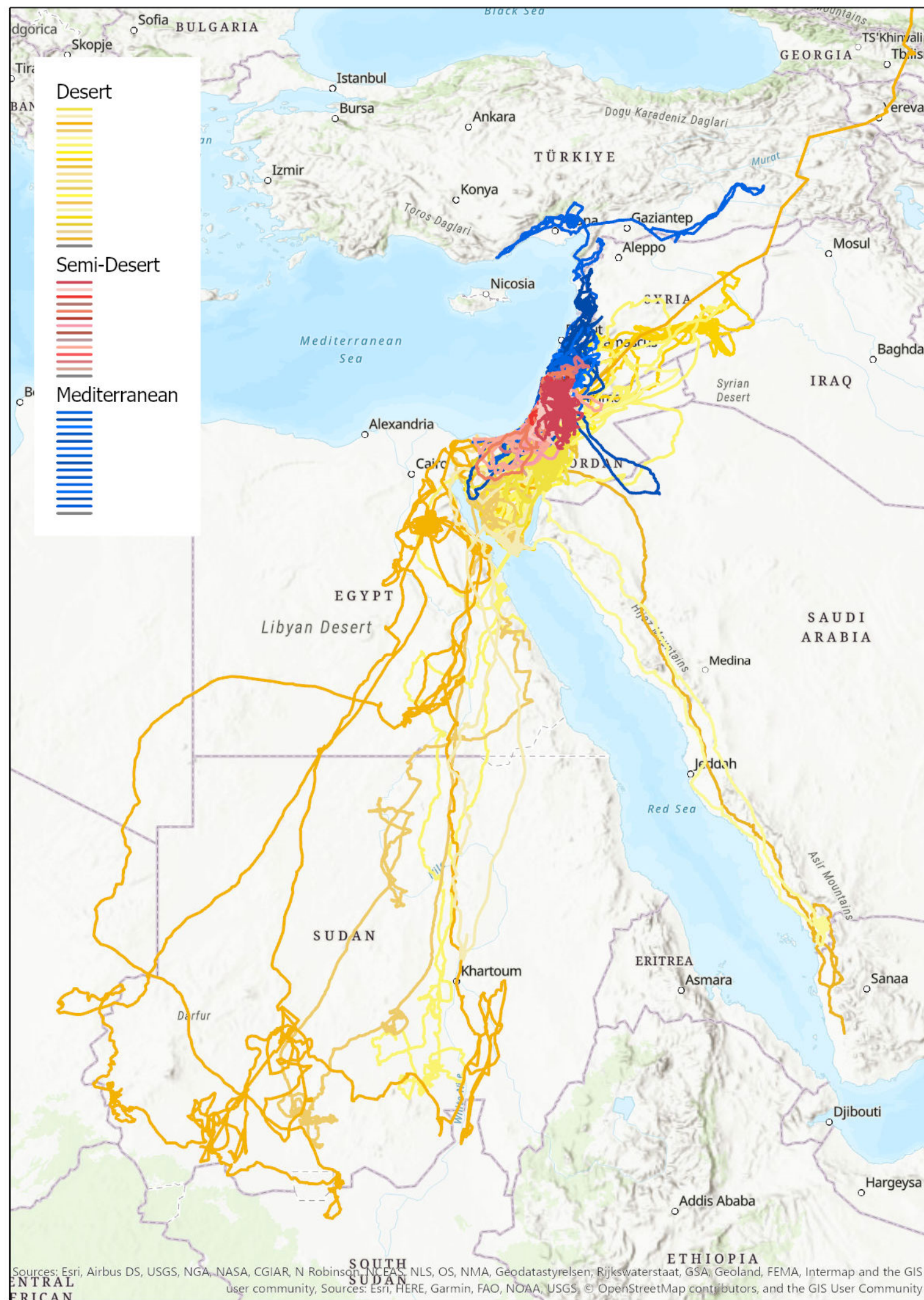
Israel's Climate & Biogeographic Zones



Dispersal Patterns

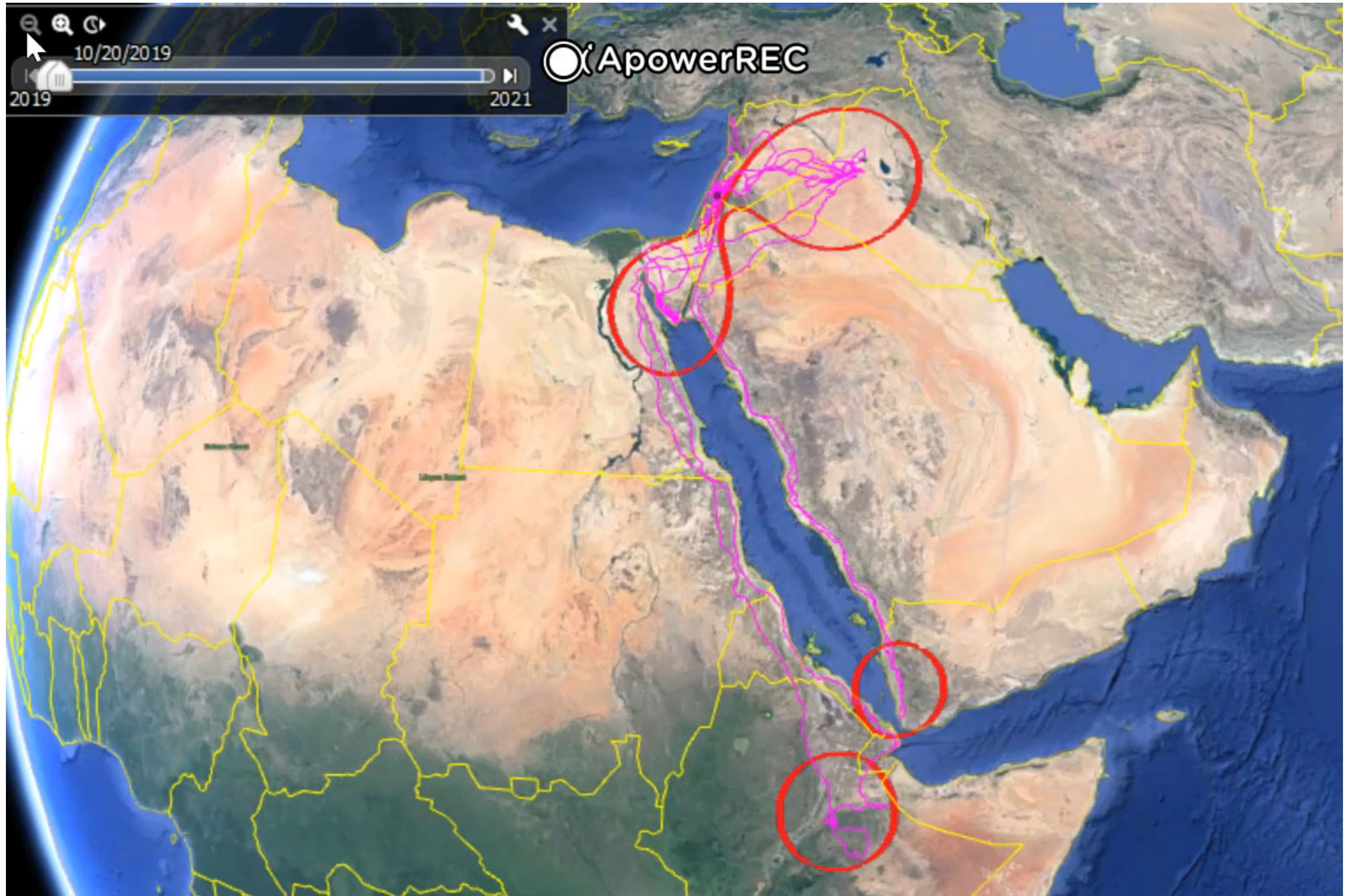
Left: Nature born
(N=46), 2017 - 2022

Right: Captive born
(N=33), 2016 - 2022



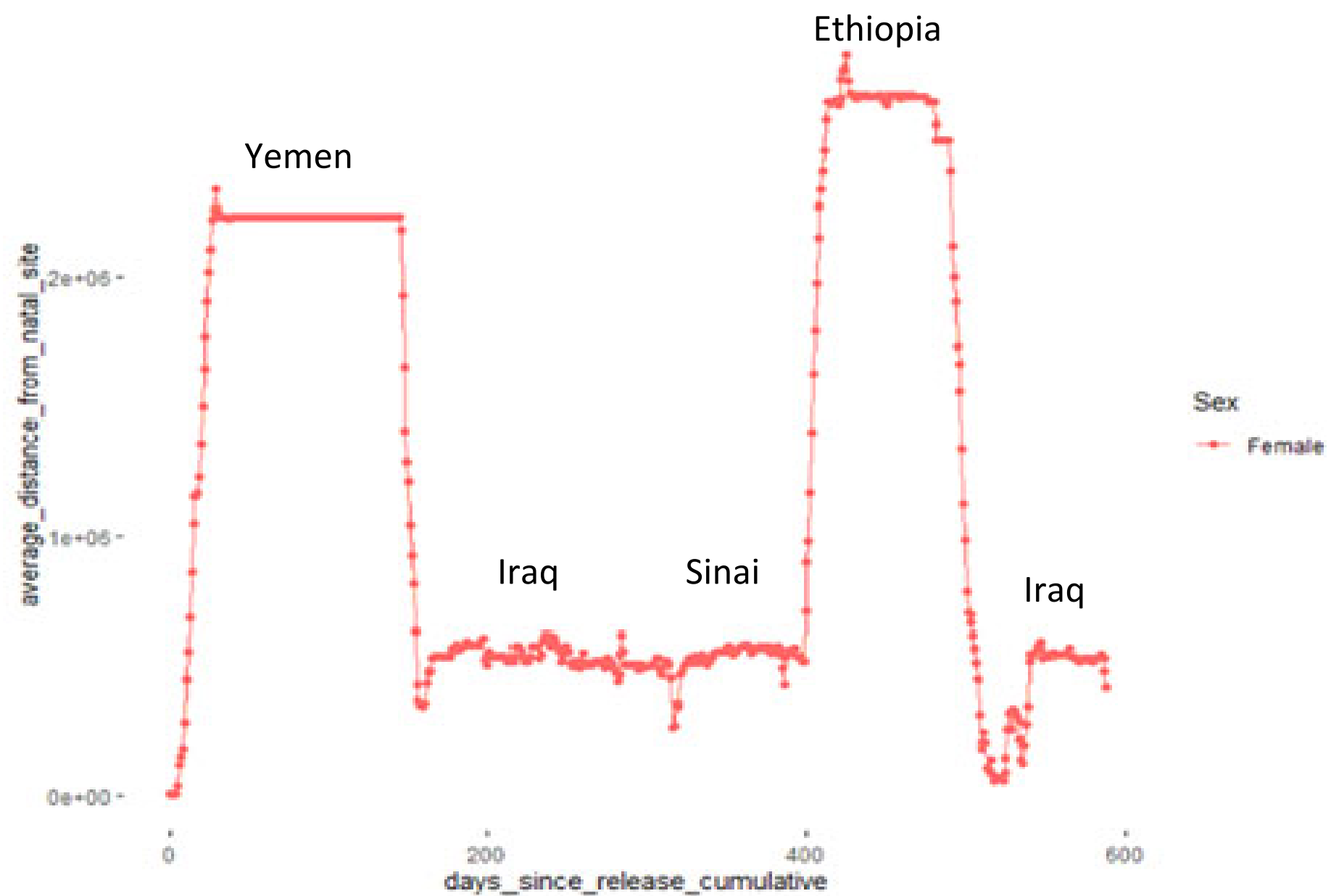
Dispersal Patterns

an example of a single individual, captive born



Dispersal Patterns

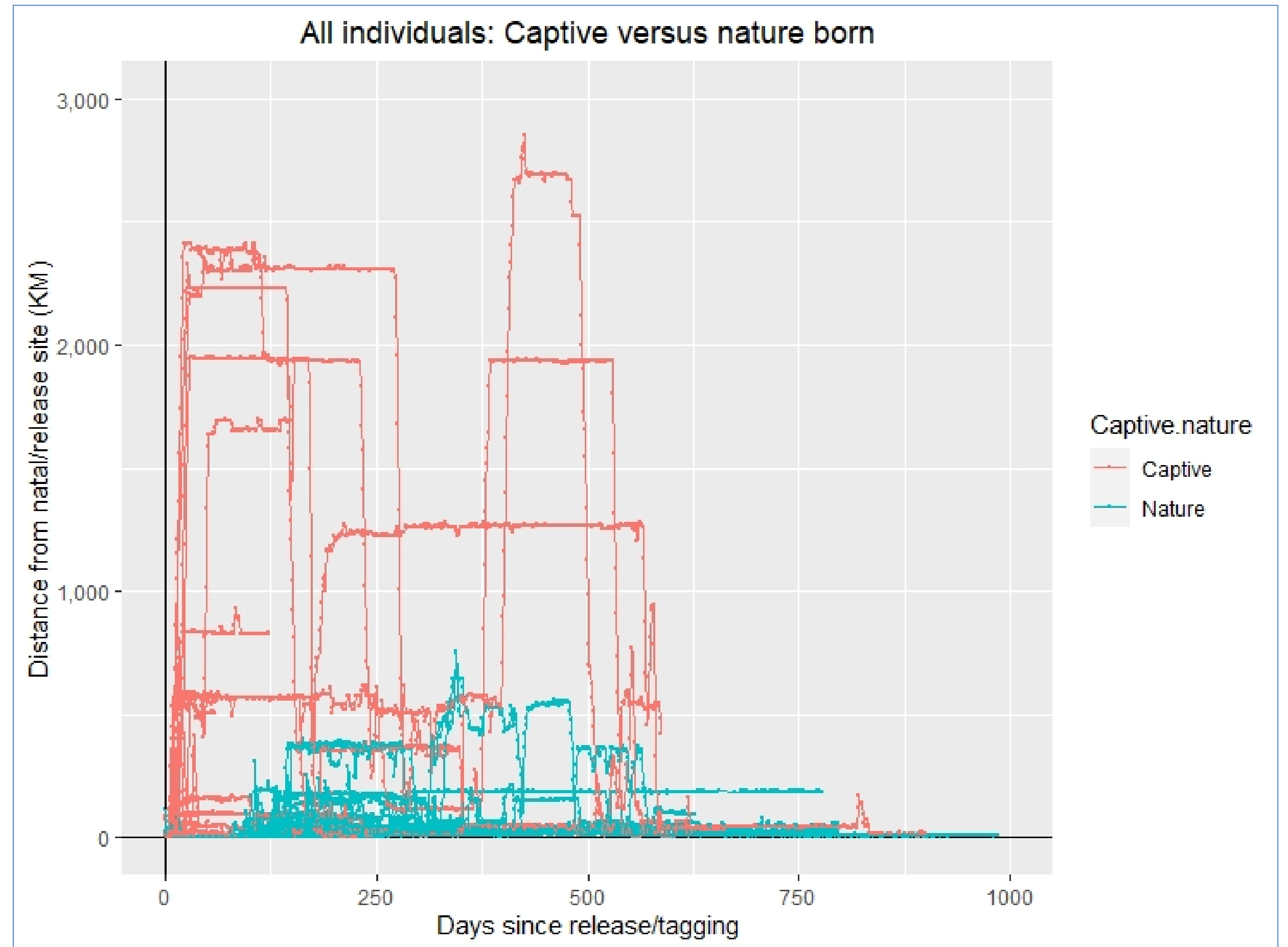
an example of a single individual, captive born



Dispersal Patterns

N (Captive) = 26

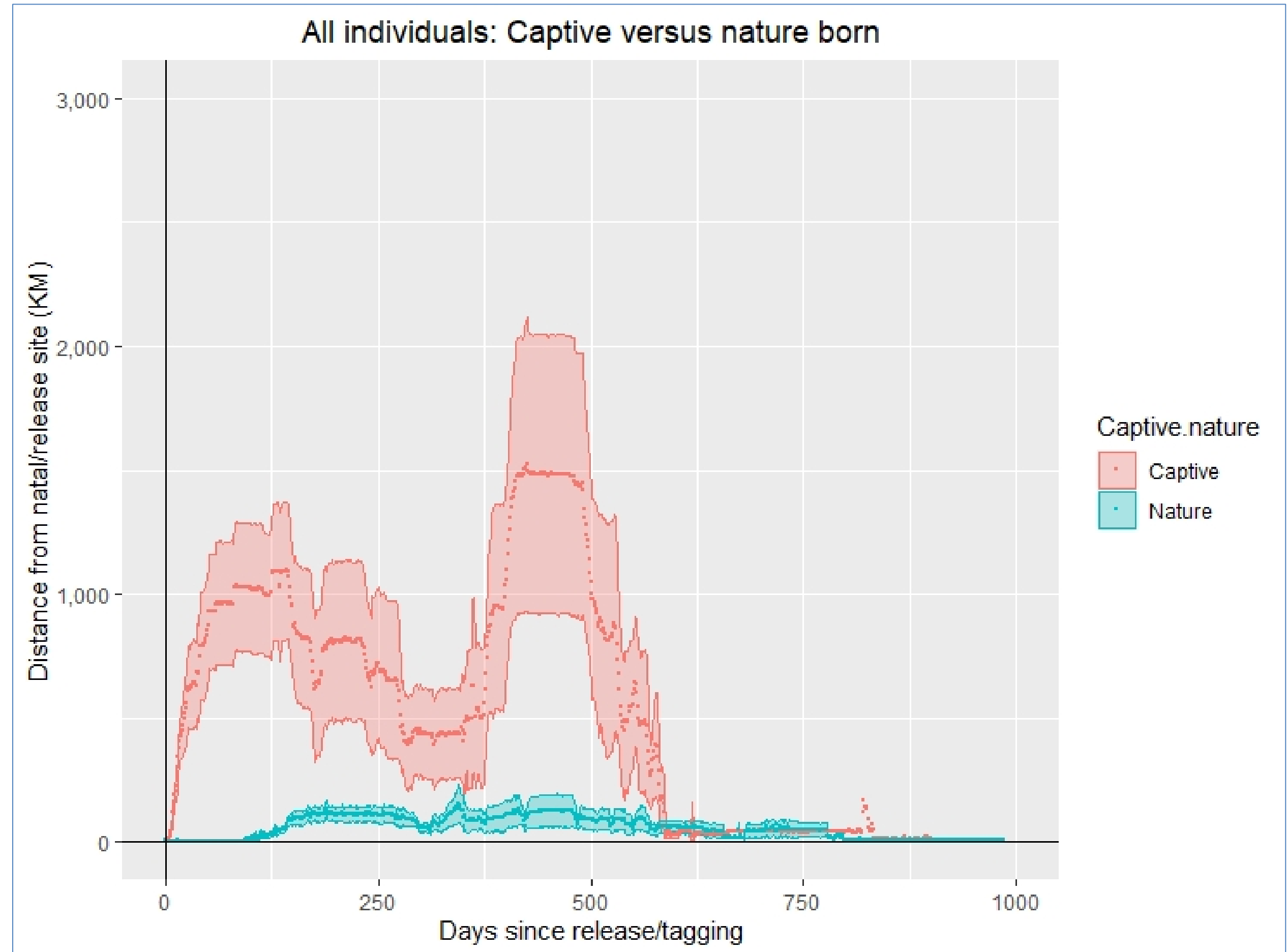
N (Nature) = 22



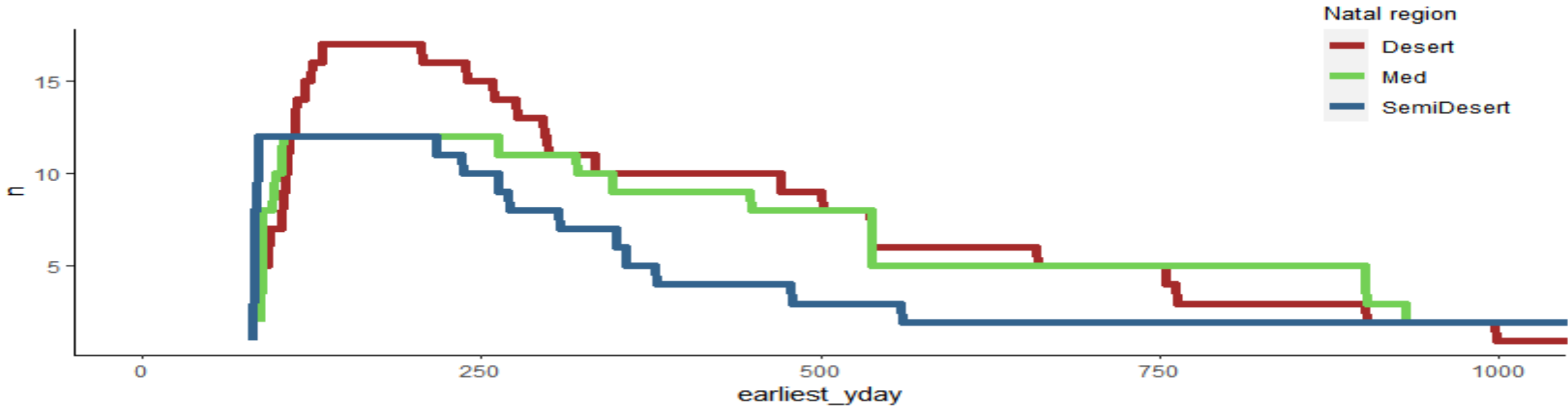
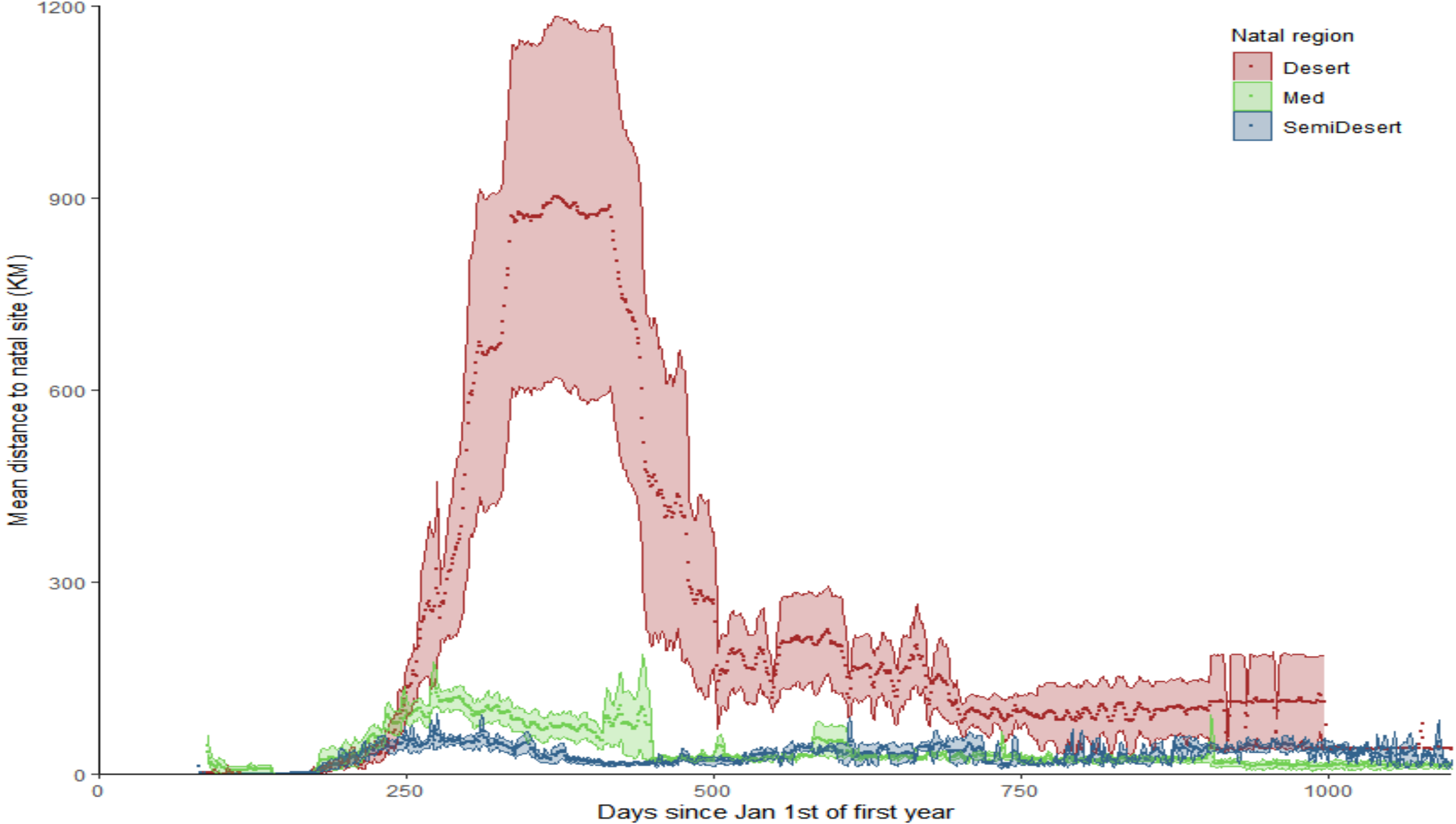
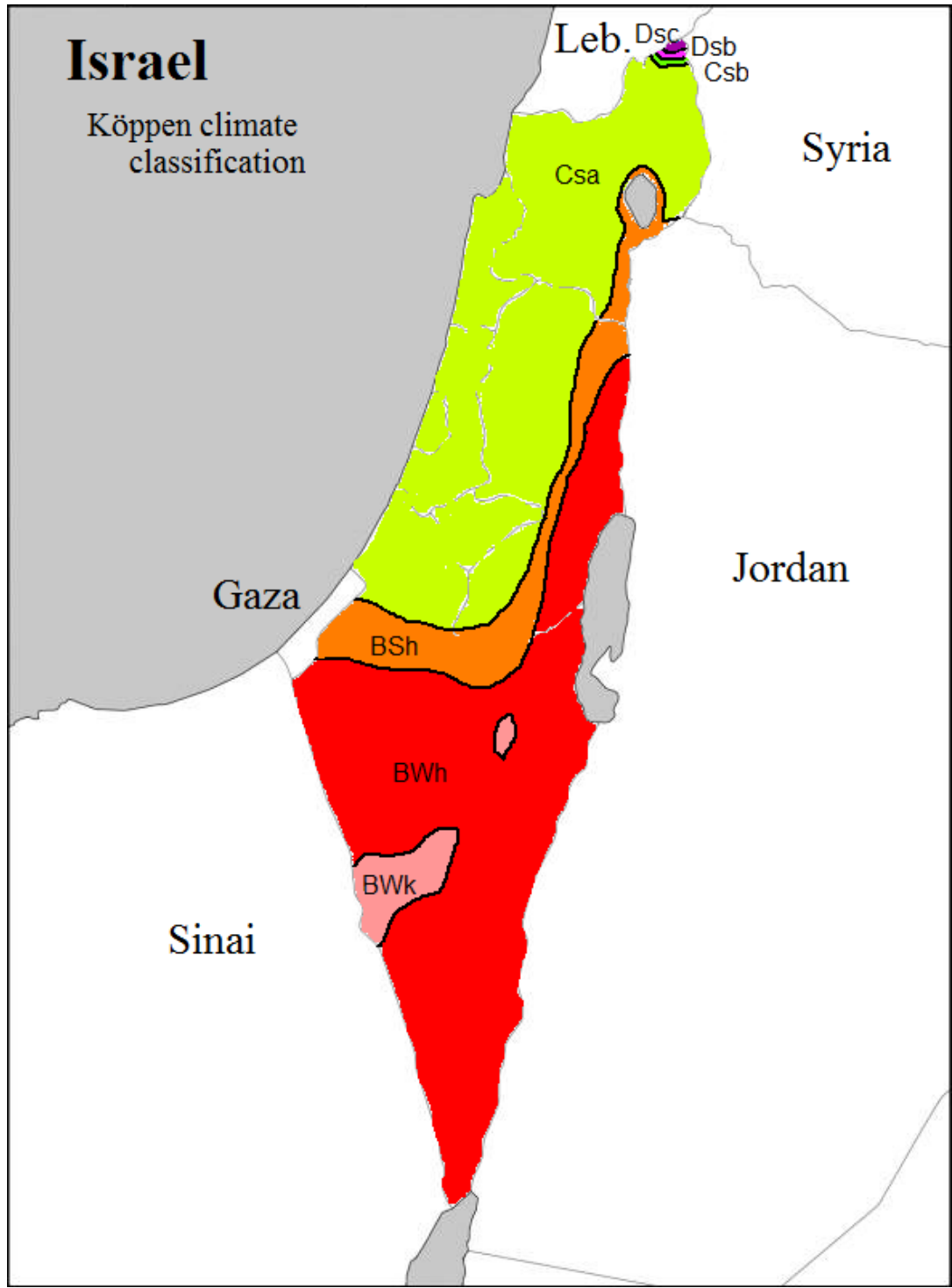
Dispersal Patterns

N (Captive) = 26

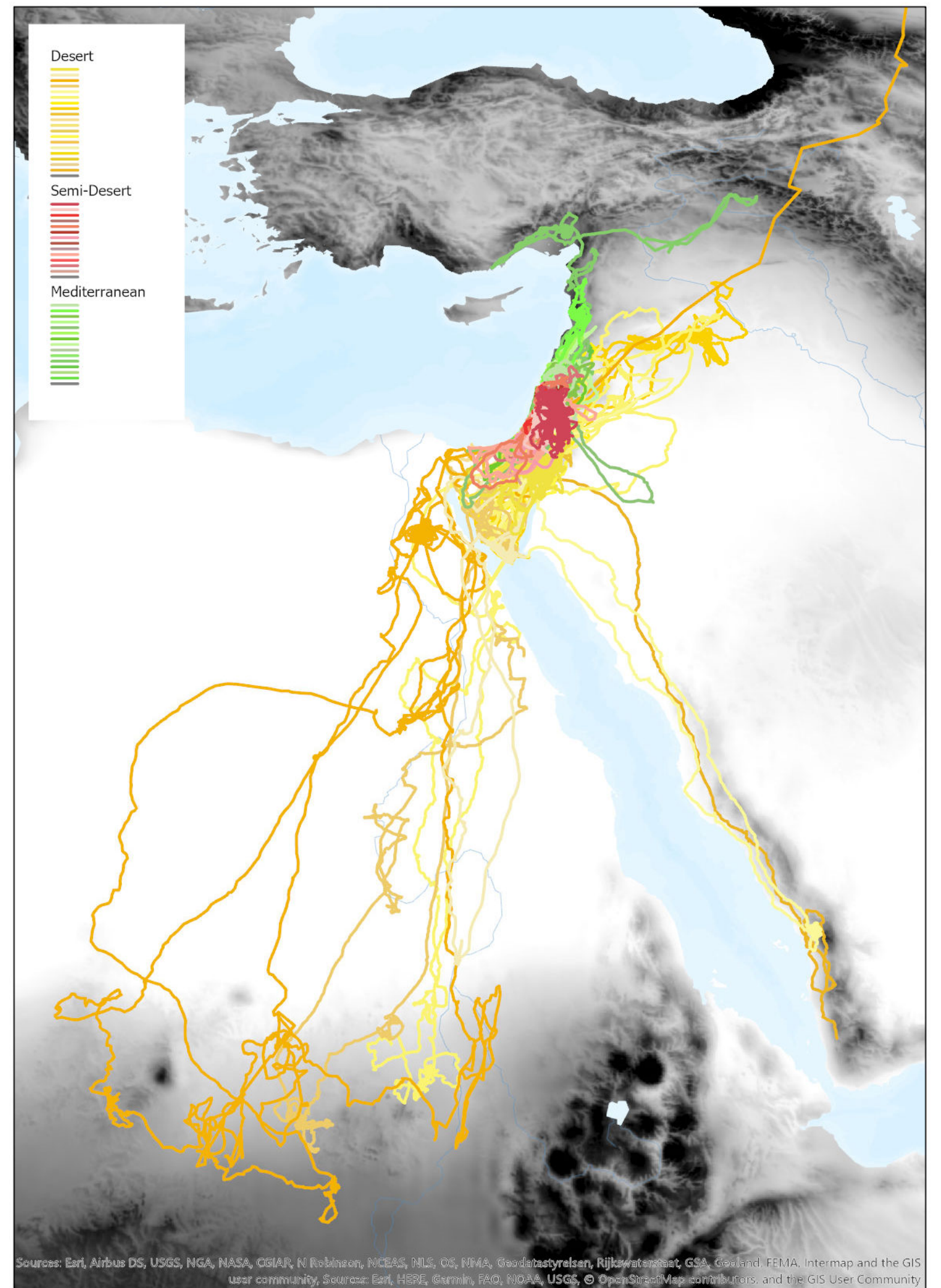
N (Nature) = 22



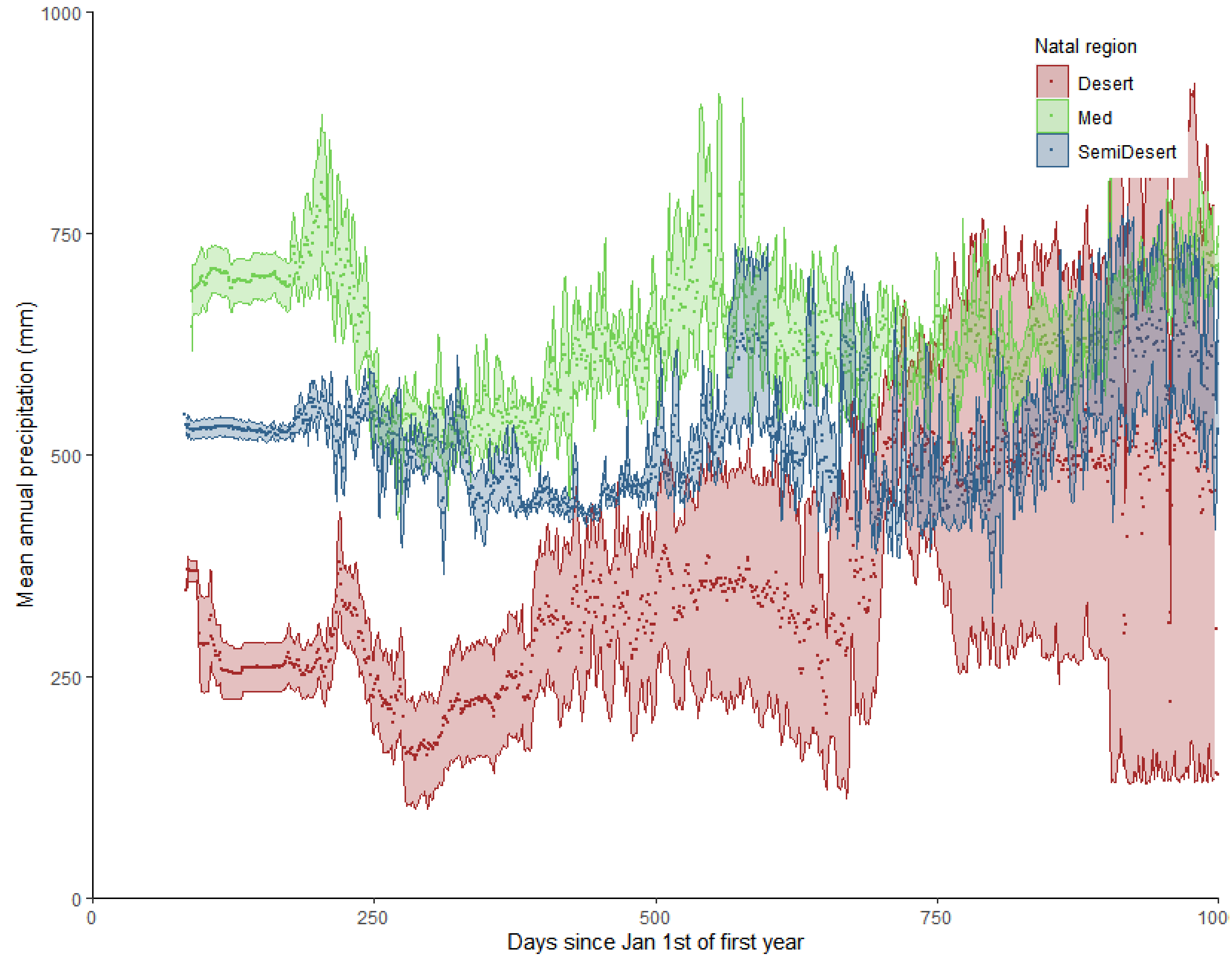
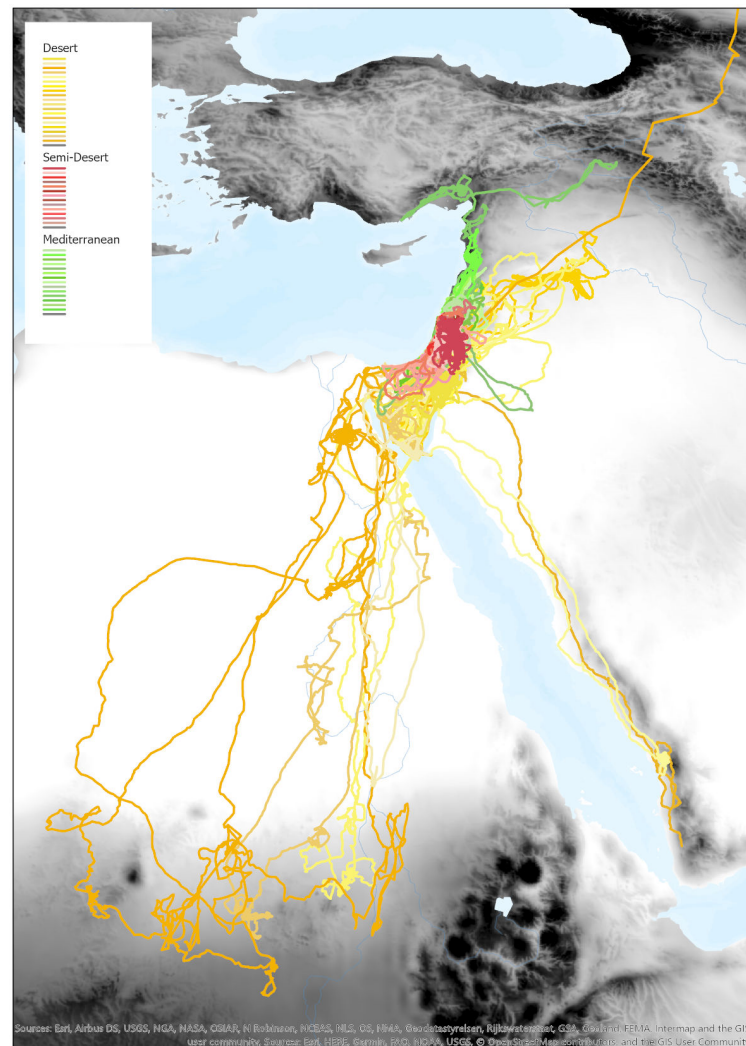
Dispersal Distances of Nature-hatched Eagles from Different Natal Habitats



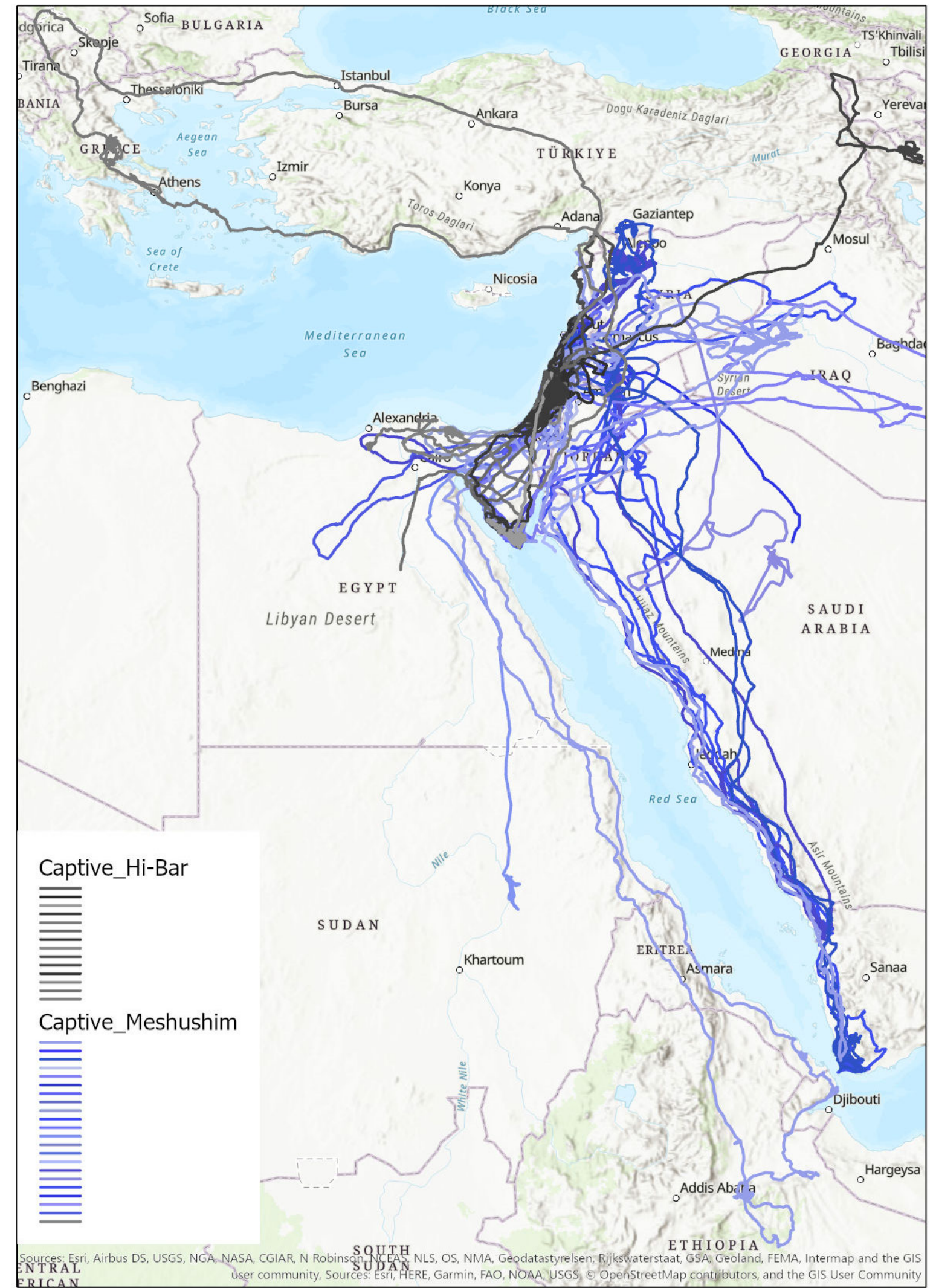
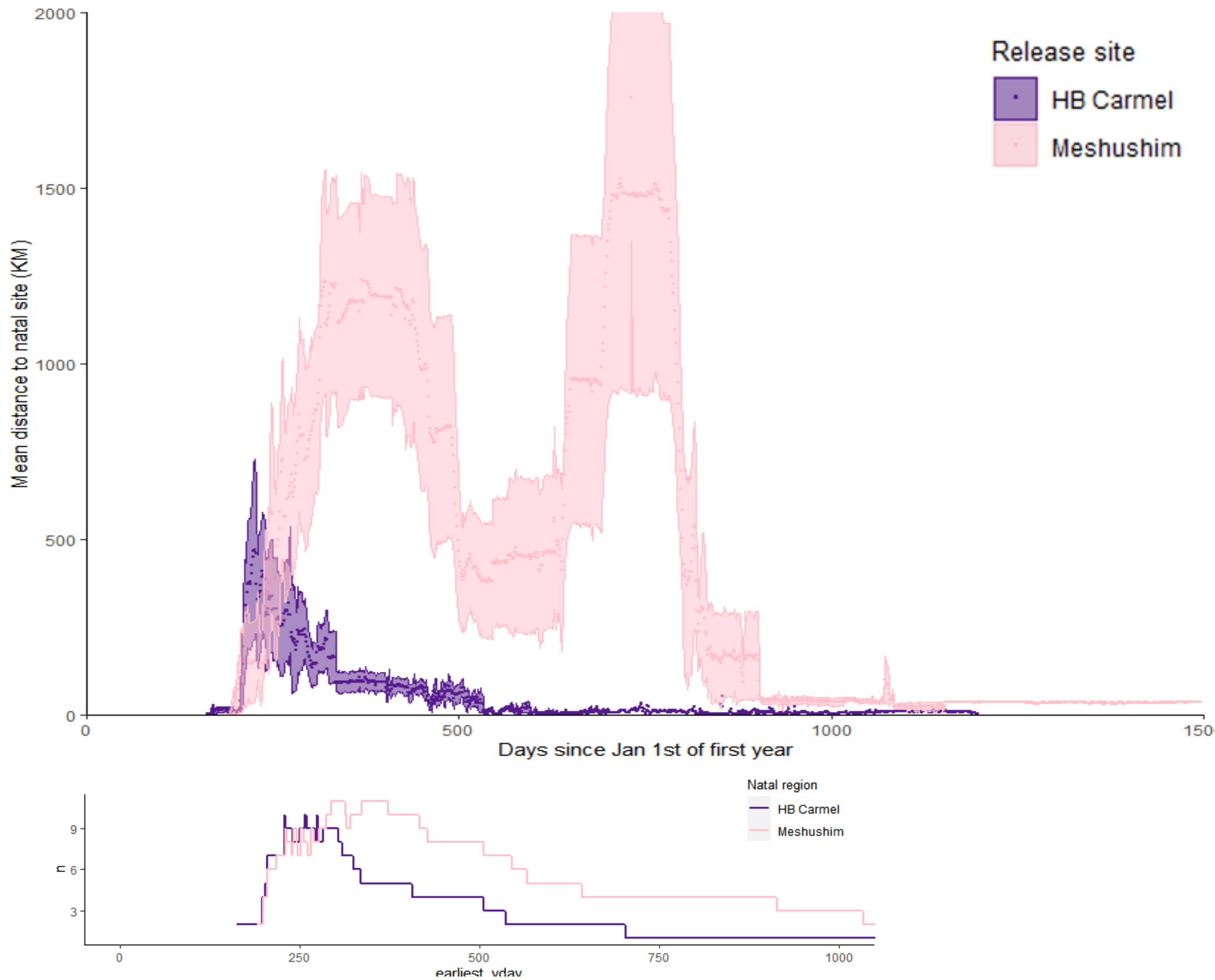
Dispersal Patterns of Eagles from Different Natal Habitats in Relation to Mean Annual Precipitation



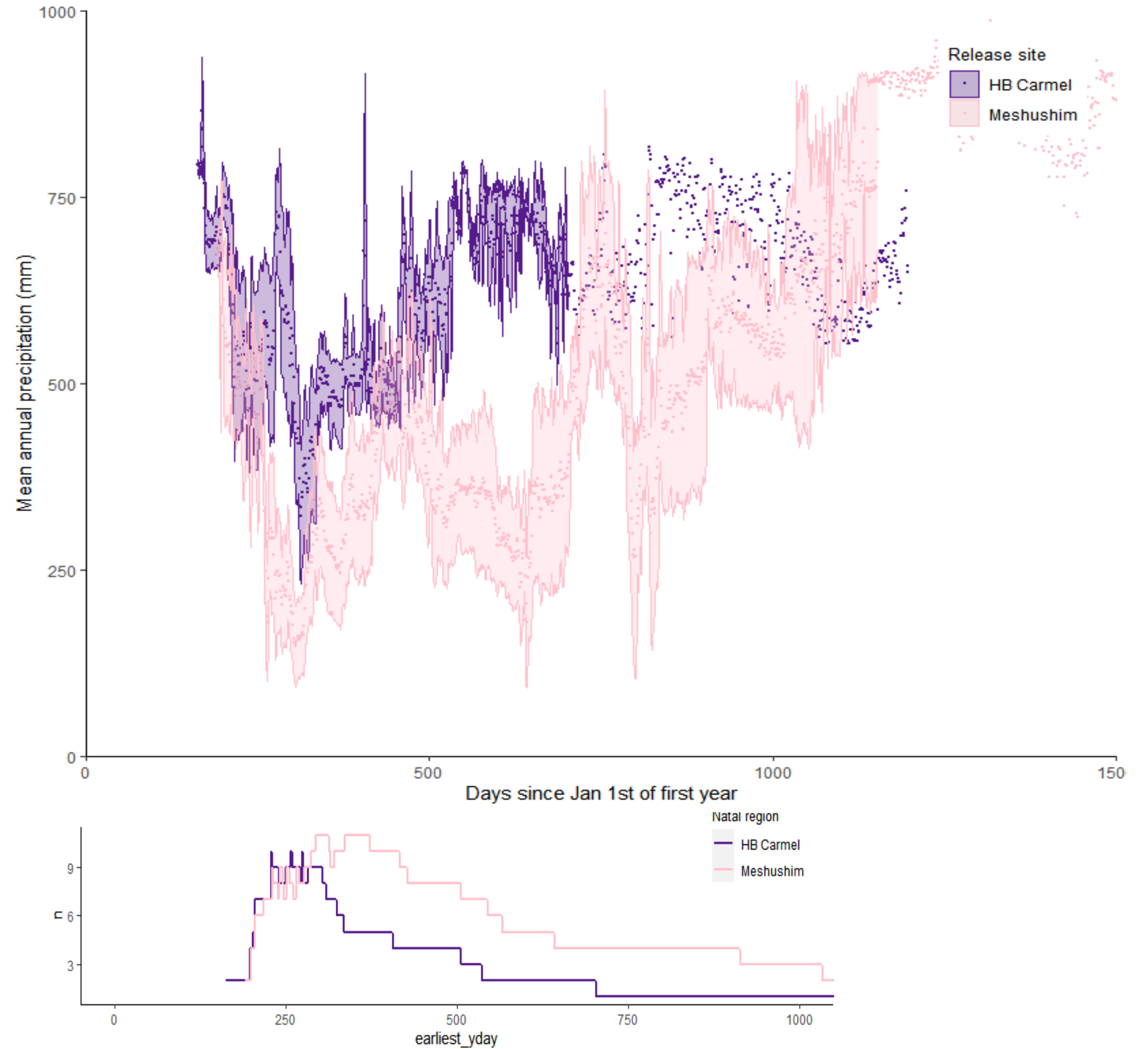
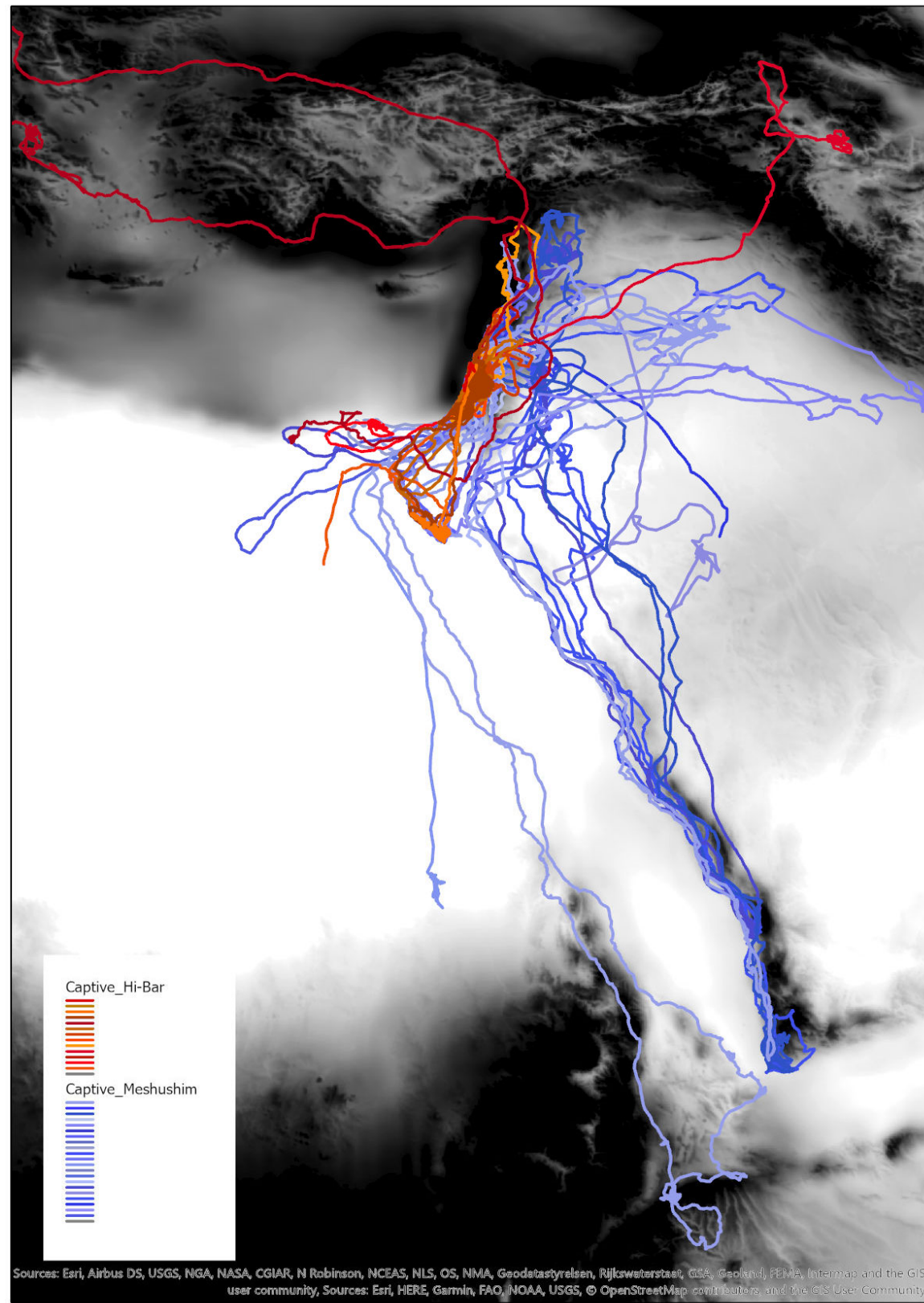
Dispersal Patterns of Eagles from Different Natal Habitats in Relation to Mean Annual Precipitation

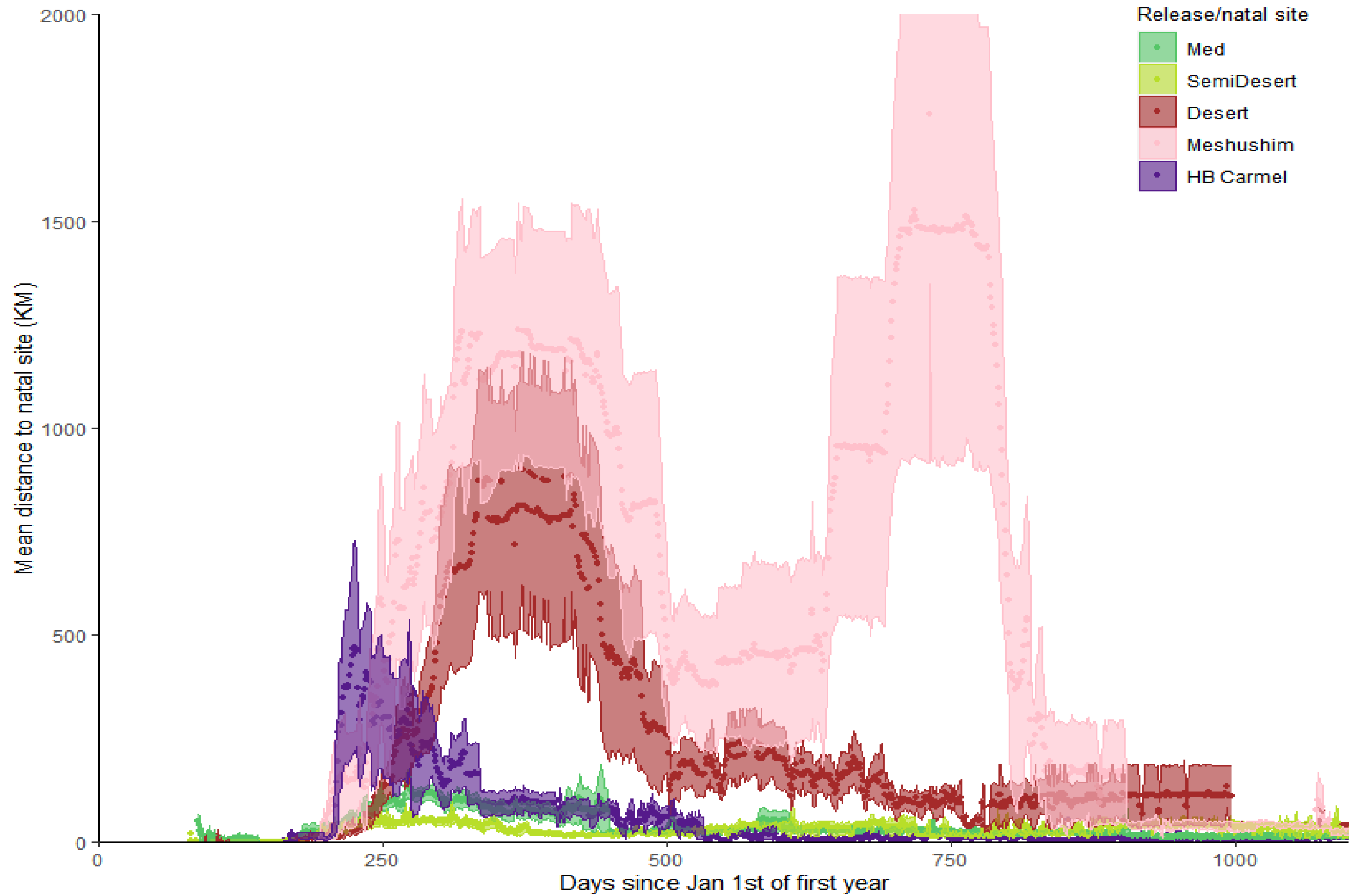


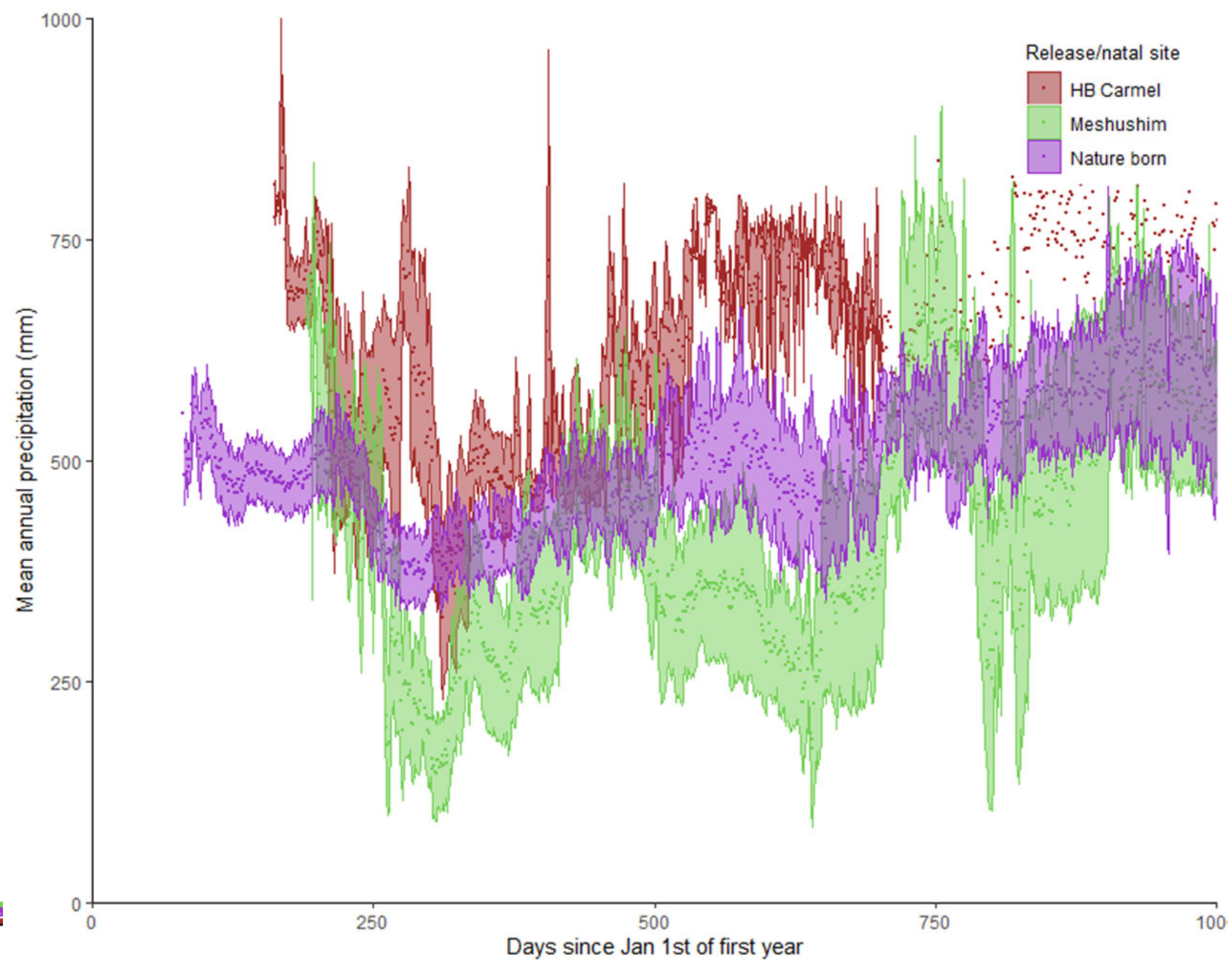
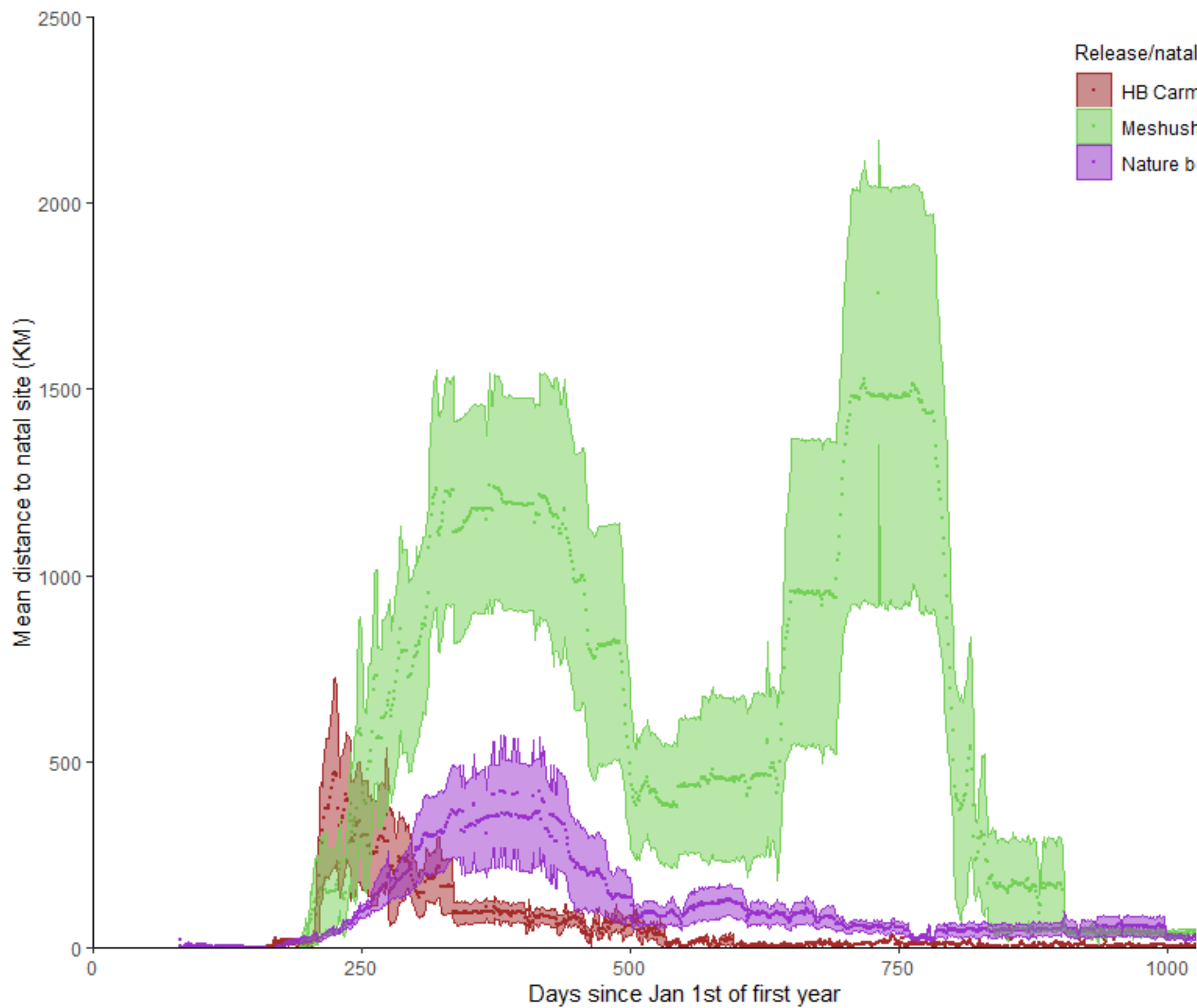
Dispersal Patterns of Captive-bred Eagles in relation to their Release site



Dispersal Patterns of Eagles in relation to their Release site



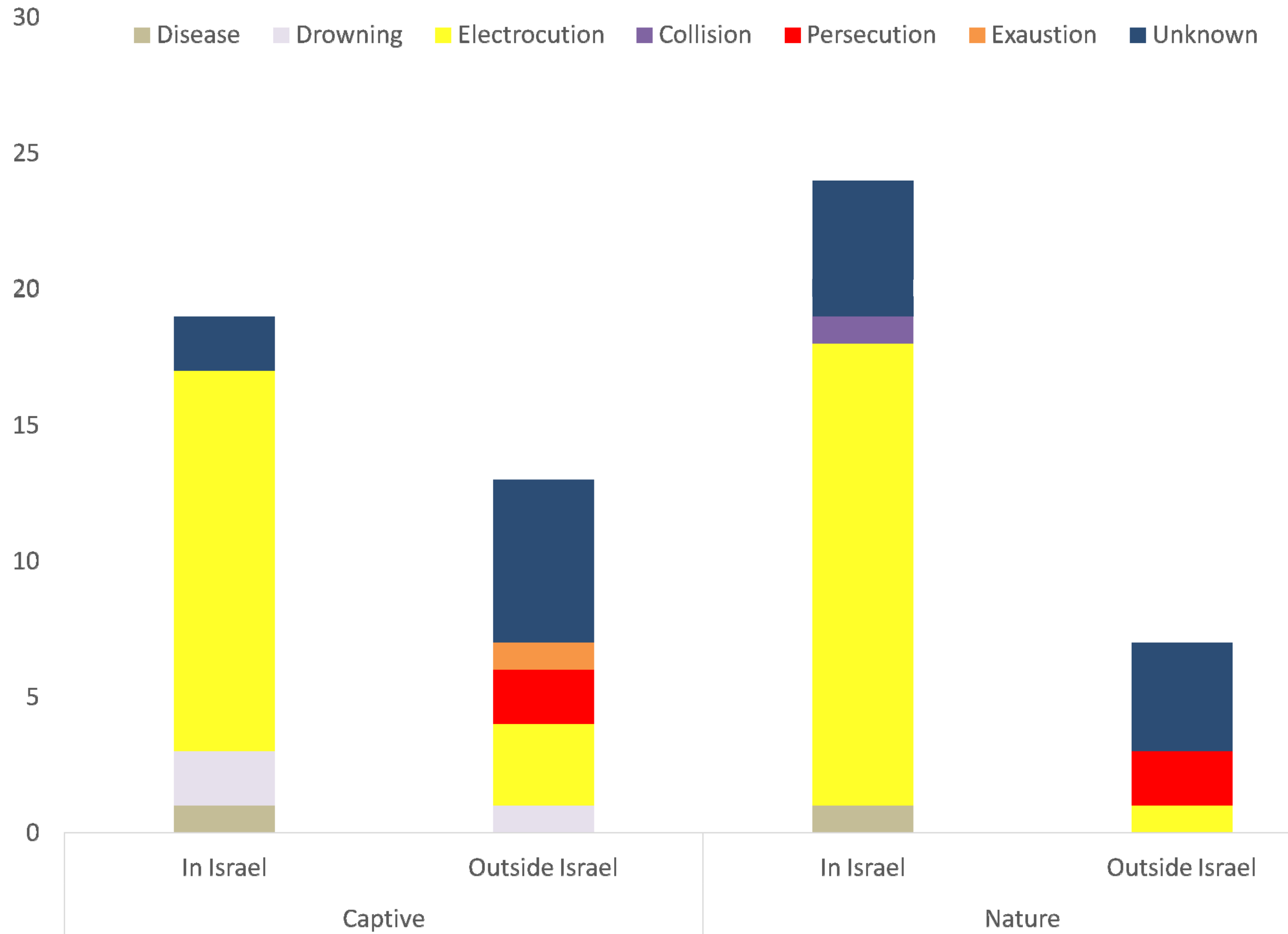




Mortality Factors

N (Captive) = 32

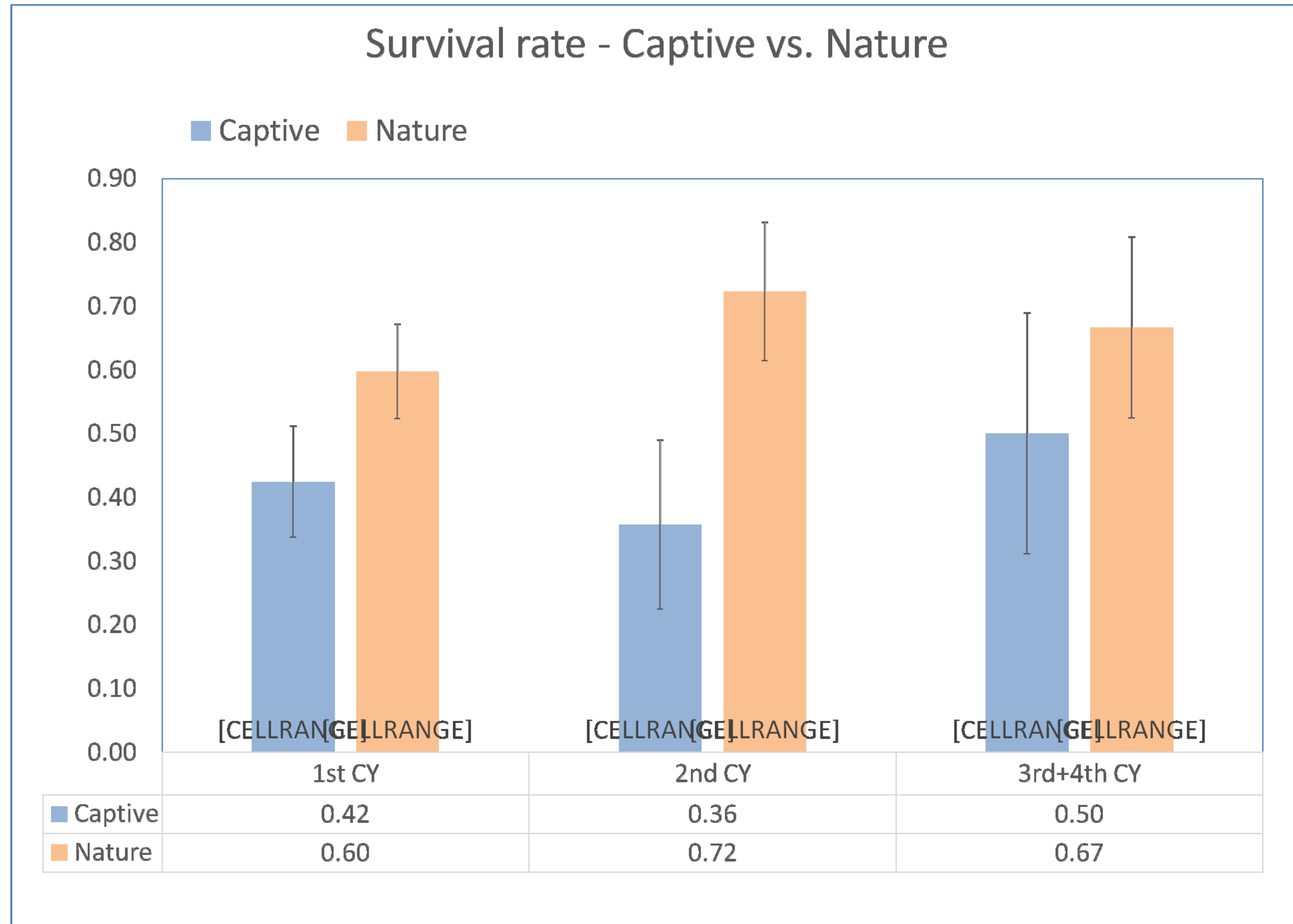
N (Nature) = 31



Survival Rates

N (Captive) = 33

N (Nature) = 46



Recruitment into the breeding population

Tagged Individuals (Attempted breeding)		
Natal Year	Captive	Nature
2015	1	
2016	4	
2017	5	
2018	5	2 (1)
2019	7 (1)	7 (3)
2020	3	10
2021	5	16
Total	30 (1)	35 (4)

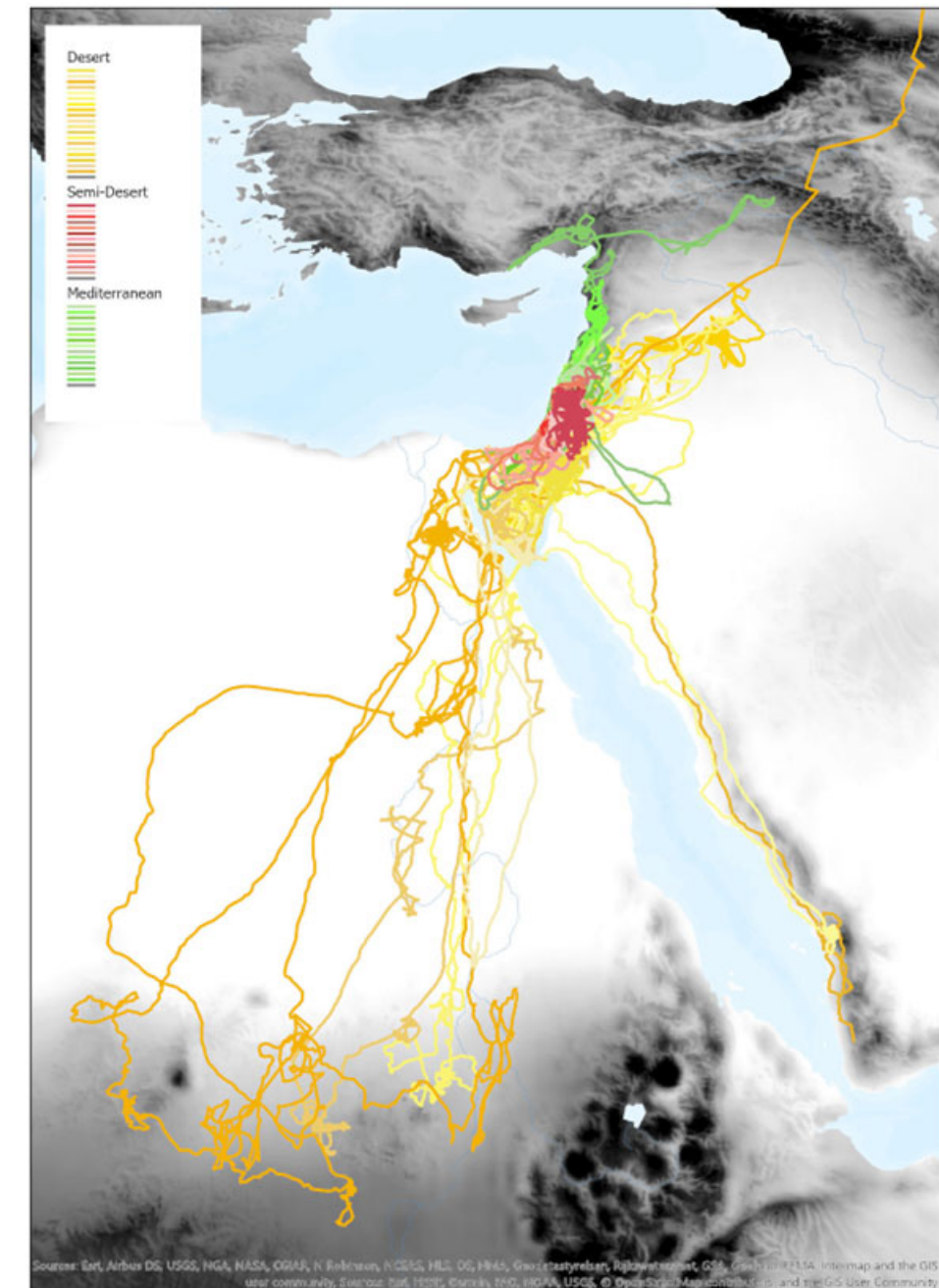


Summary and conclusions

There are significant differences in the habitat preferences of the juvenile Bonelli's during dispersal, depending on their natal sites:

Eagles from each biogeographic zone (Mediterranean, Semi-desert, desert) tend to stay in the same zone during their dispersal.

Eagles from the desert region are flying longer distances, maybe due to the need to cross the Sahara.



Summary and conclusions

We have evidence that the release of eaglets from the breeding nucleus does contribute to the wild population, however:

- Captive-bred individuals released far from their parents & natal site tend to disperse farther away (lesser philopatry)
- Captive-bred eagles have lower survival rates (differences between the two release methods?)
- Lesser recruitment rates compared to wild-hatched.

Other than the direct contribution of releasing the eaglets, the breeding nucleus enable us to intervene in the breeding attempts of the wild population and increase its productivity.



Thanks for
listening!

Nesting interventions in the wild

Other benefit of the breeding nucleus – allows to perform intensive interventions in the wild in order to increase the productivity of the population

Being done in cases that:

-One of the parents die during the breeding season – Egg removal from the nest.

The eggs are artificially incubated and the hatched chicks either hand-raised or adopted by a fostering pair in captivity.

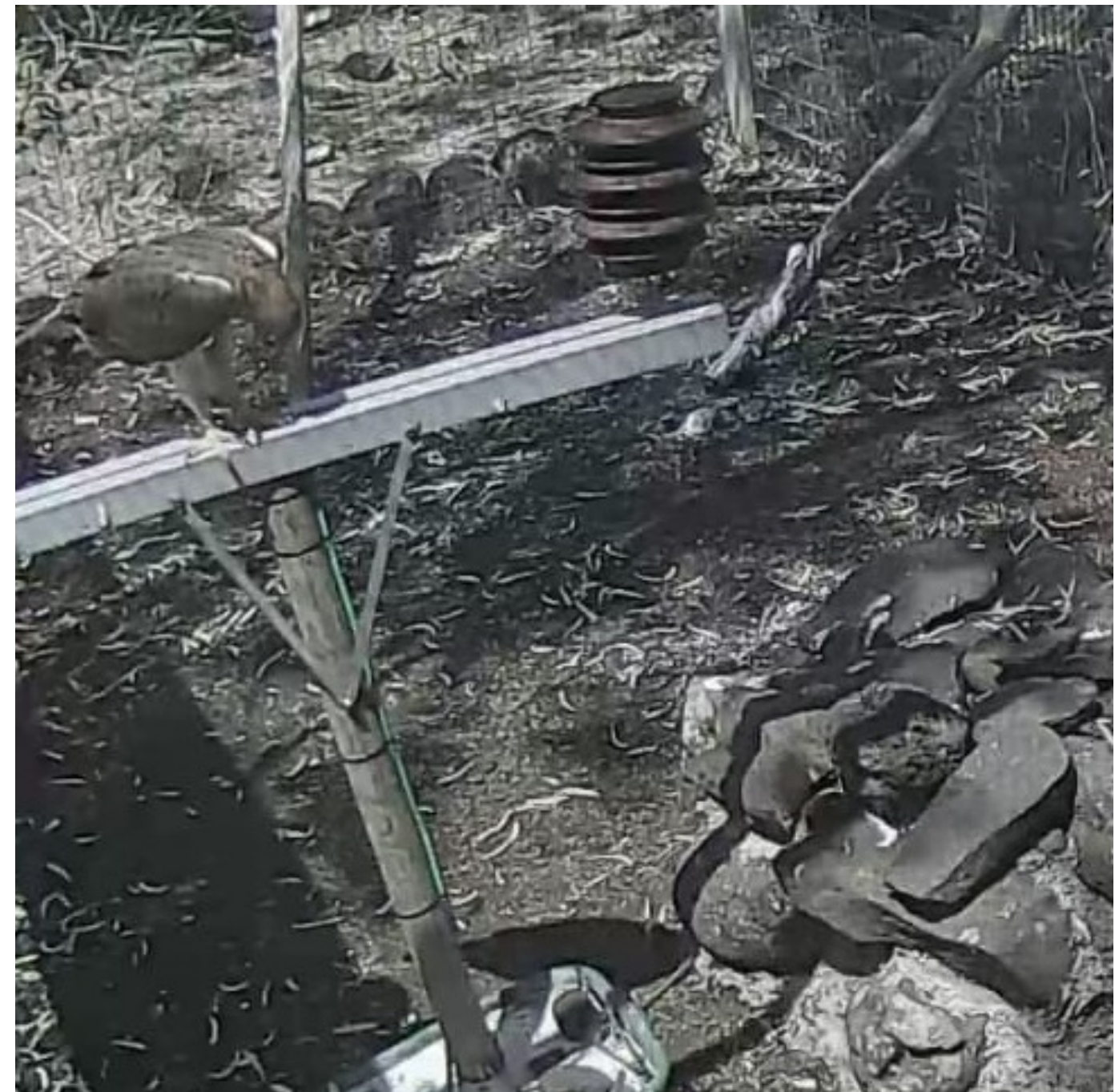
-Incubation last more than 42 days (indicating infertile eggs) – fertile eggs from the captive nucleus are implanted in the nest.





From egg to release

- The eaglets learn to hunt from their parents, with live prey.
- Training the eaglets to avoid perching on power poles using a power-pole replica in the cage (with low-power electrical shock).



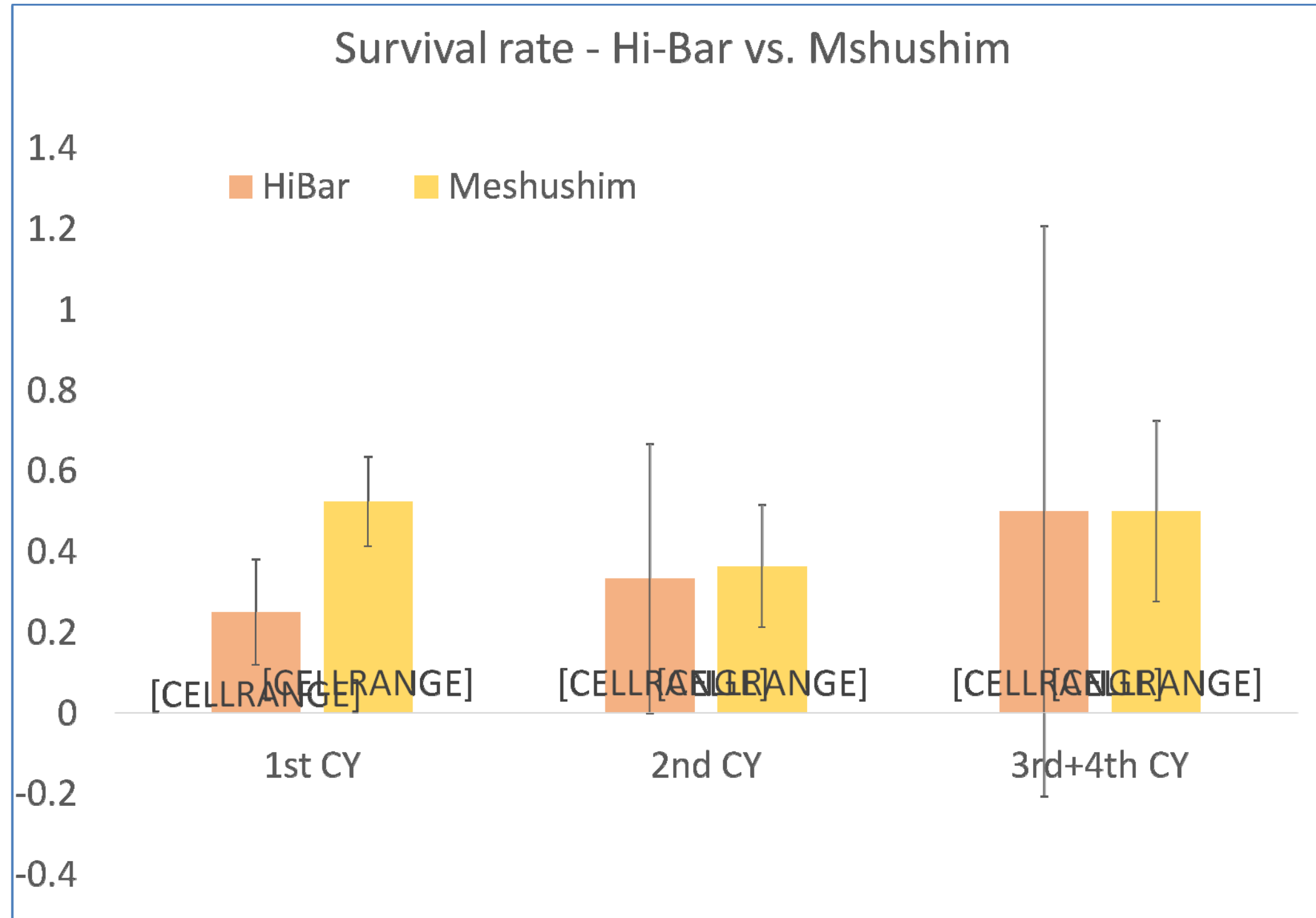
The egg accepted and chick fledged successfully.



Survival Rates

N (Meshushim) = 21

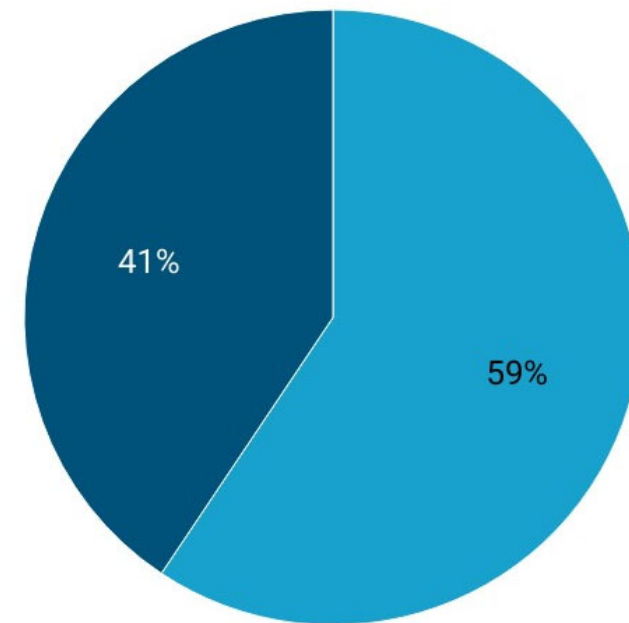
N (Hibar) = 12



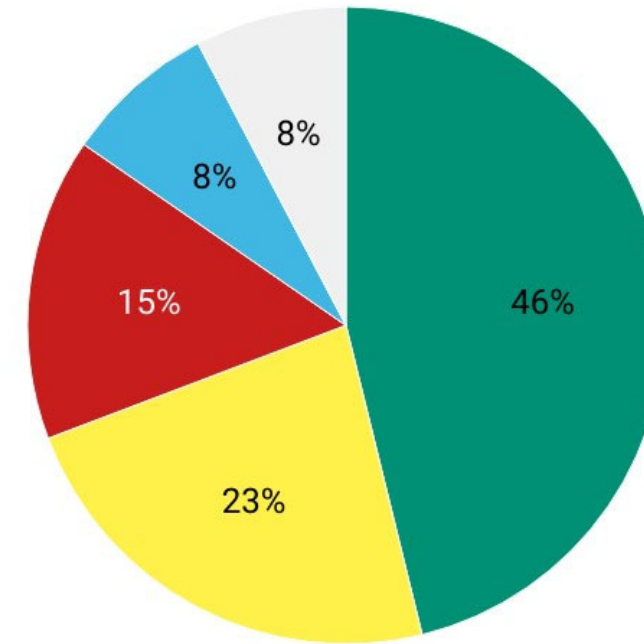
[Death causes of Captive born Bonelli's]

Unknown Electrocutation Human Drowning Exhaustion Disease

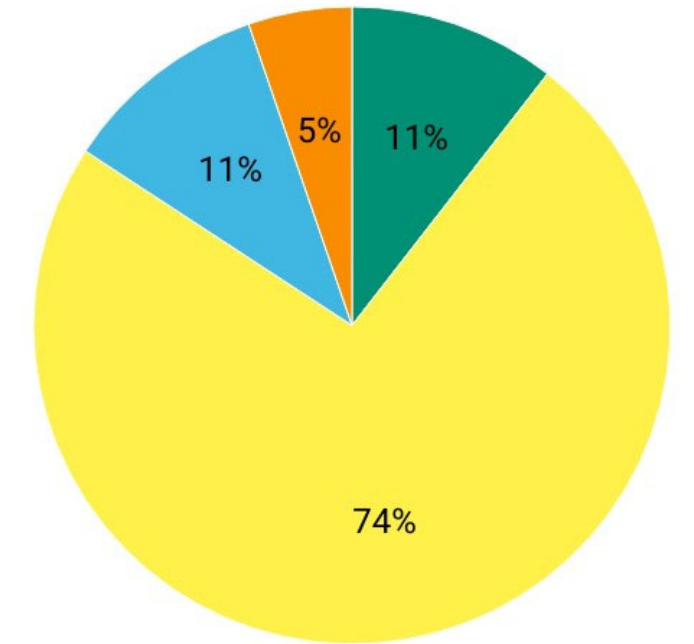
In Israel Outside Israel



Captive
Total: 32



Outside Israel
Total: 13

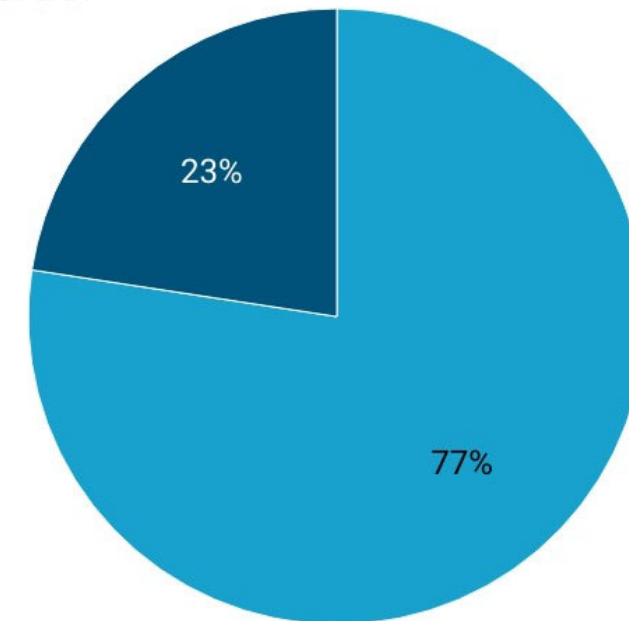


In Israel
Total: 19

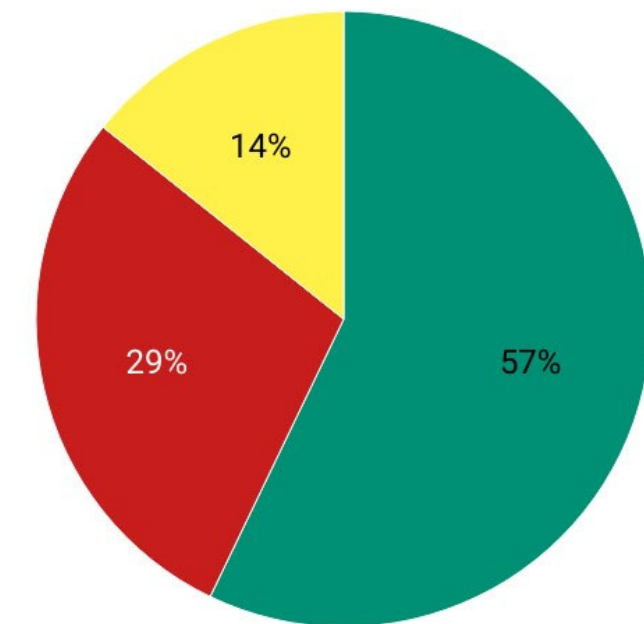
[Death causes of Nature born Bonelli's]

Unknown Human Electrocutation Collision Disease Unknown-predispersal

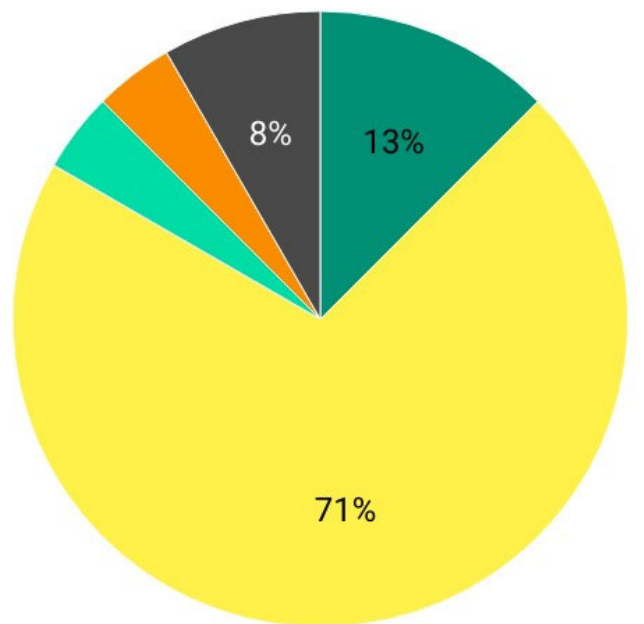
In Israel Outside Israel



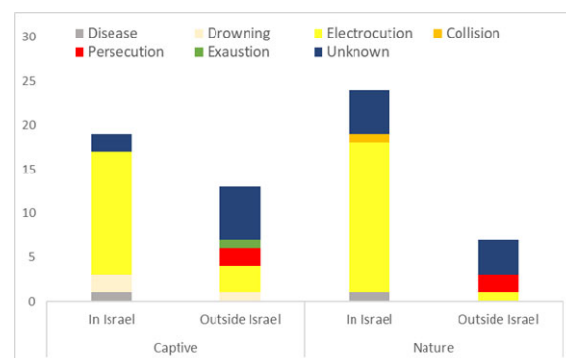
Nature
Total: 31



Outside Israel
Total: 7



In Israel
Total: 24



Does the release from captive breeding contribute to the wild population?

Year	released from Captive	Fledged from Guarded Nests
2003	2	
2004	1	
2005	2	
2006	1	
2007	1	
2008	4	
2009	6	
2010	3	
2011	4	
2012	7	
2013	4	
2014	4	
2015	2	1
2016	4	1
2017	6	2
2018	6	4
2019	7	2
2020	3	4
2021	7	2
2022	3	4
2023	1	4
Total	78	24

