DEFINING HABITABILITY

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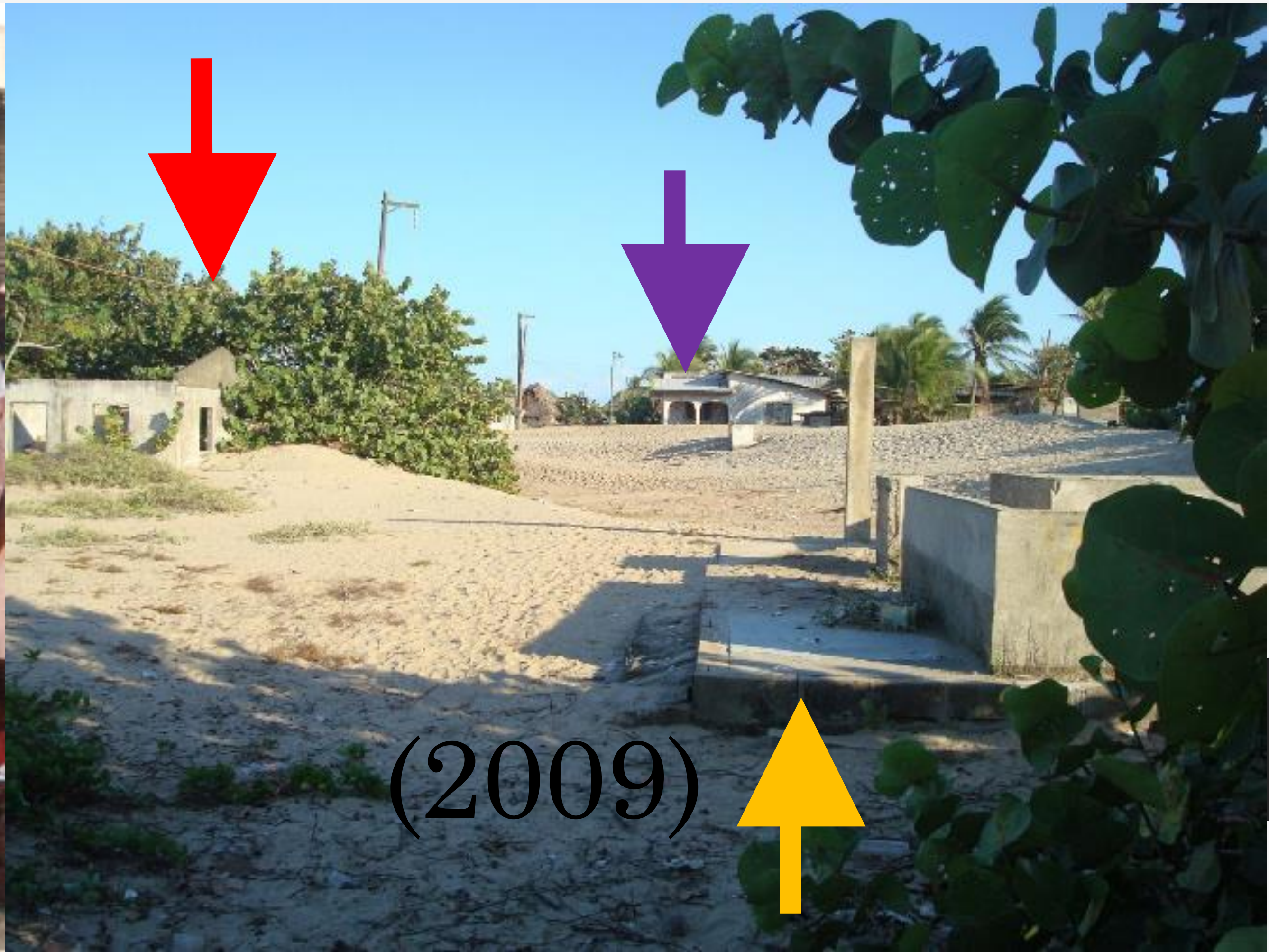
Longitudinal study of climate change and habitability, Santa Rosa de Aguán, Honduras



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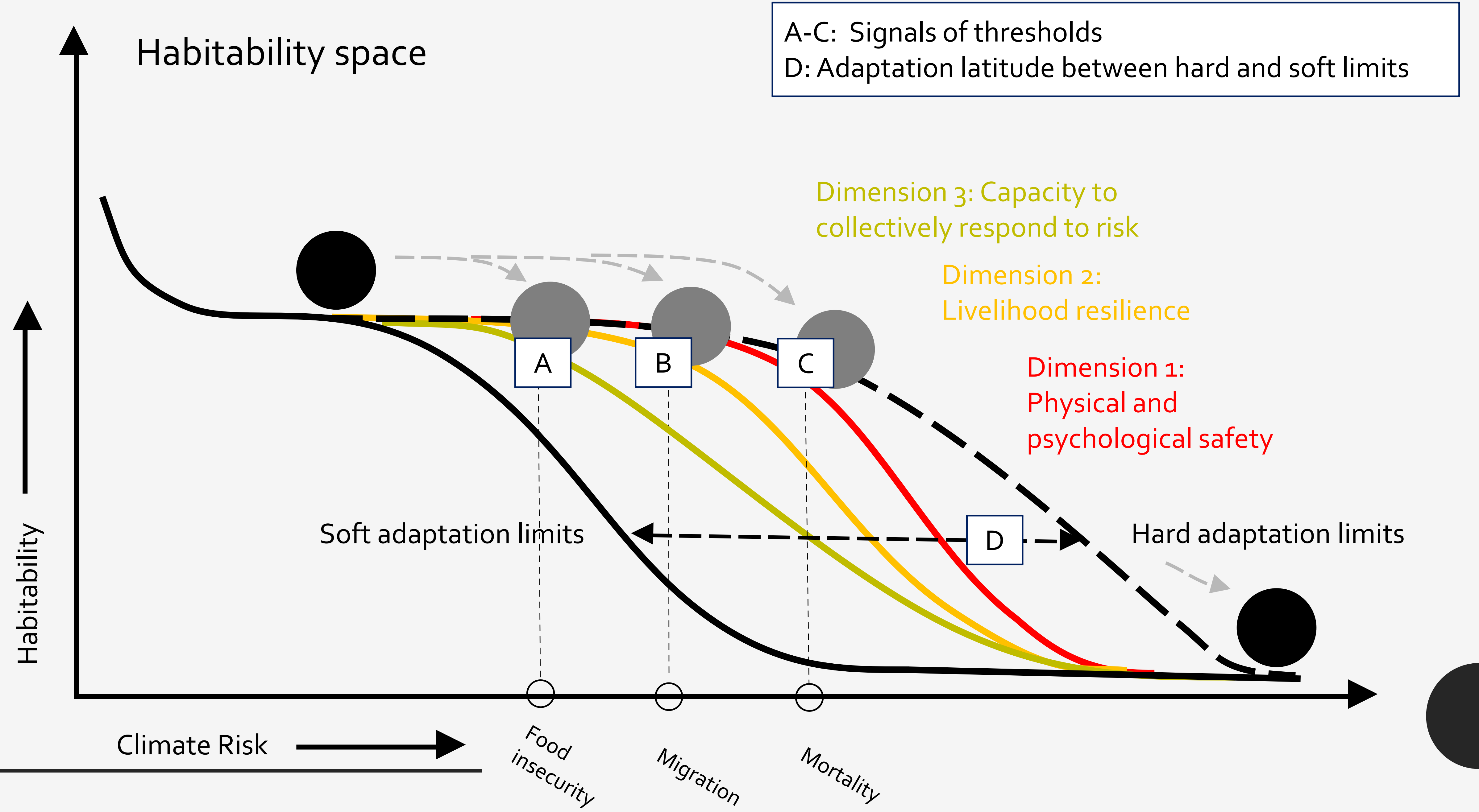
1) Physical and psychological safety,
2) Livelihood resilience,
3) Capacity to collectively adapt to environmental risk

(2021)


A-C: Signals of thresholds
D: Adaptation latitude between hard and soft limits
Habitability space
Dimension 3: Capacity to collectively respond to risk
Dimension 2: Livelihood resilience
Dimension 1: Physical and psychological safety
A
B
C
D
Soft adaptation limits
Hard adaptation limits
Habitability
Climate Risk
Food insecurity
Migration
Mortality

Habitability = the sum of individual determinations, i, made by people in group n

$$H = \frac{1}{n}\sum_{i}^{n}\left[\frac{AC_w}{e_w \cdot s_w}, \frac{AC_l}{e_l \cdot s_l}\right]_i$$

Habitability

safety *livelihoods*

$$H = \frac{1}{n}\sum_{i}^{n}\left[\frac{AC_w}{e_w \cdot s_w}, \frac{AC_l}{e_l \cdot s_l}\right]_i$$

…where the sensitivity of people's *safety* to climate hazards, s_w, multiplied by their *exposure* to climate hazards e_w, is fractionally weighted against the *capacity to adapt* to meet the goal of *safety* amidst changing conditions, AC_w.

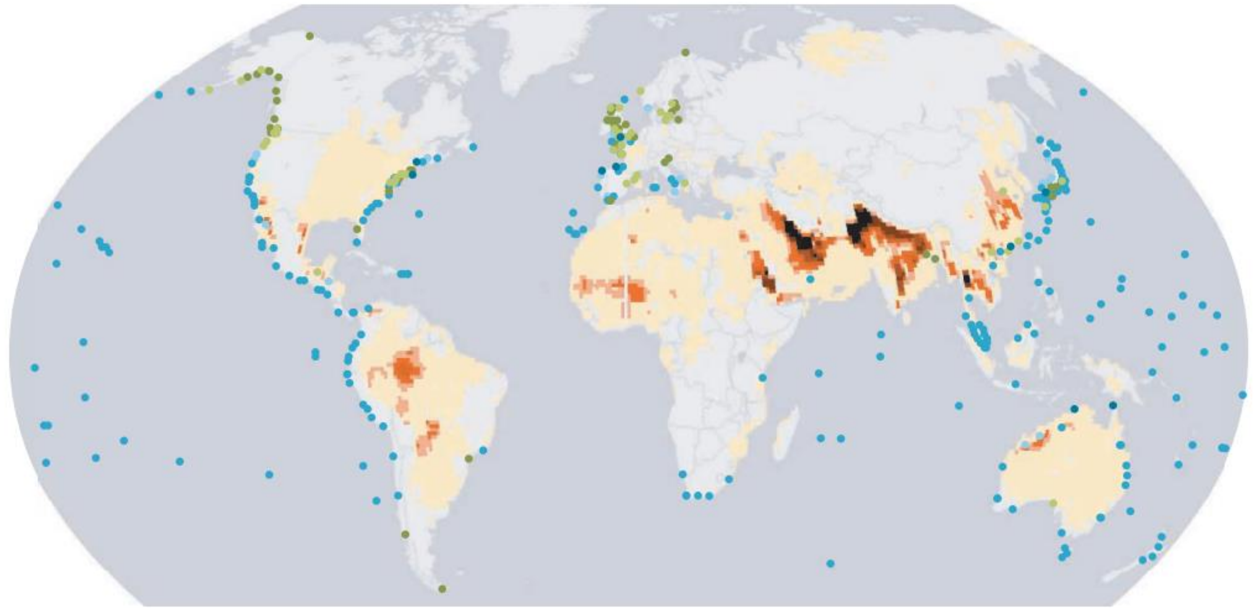
Habitability

$$H = \frac{1}{n}\sum_{i}^{n}\left[\frac{AC_w}{e_w \cdot s_w}\right.$$

exposure ▪ sensitivity

Frequent exceedance by 2100 of historically rare climate thresholds

Under the high-emissions scenario RCP8.5, at most coastal locations extreme sea level events historically defined as 1-in-100-year events are projected to range in frequency from once per year to more than 10 times per year due to the effects of sea level rise alone. Only point locations where historical event data are available are shown. Projected number of days per year by 2100 exceeding a 33°C wet bulb globe temperature (WBGT) in a high-emissions scenario are also depicted. Under standard assumptions of wind and solar radiation, a WBGT of 33°C corresponds to a wet bulb temperature of roughly 31.5°C. [Sea level data are from figure 4.12 in (*8*); WBGT data are from figure 3 in (*12*).]

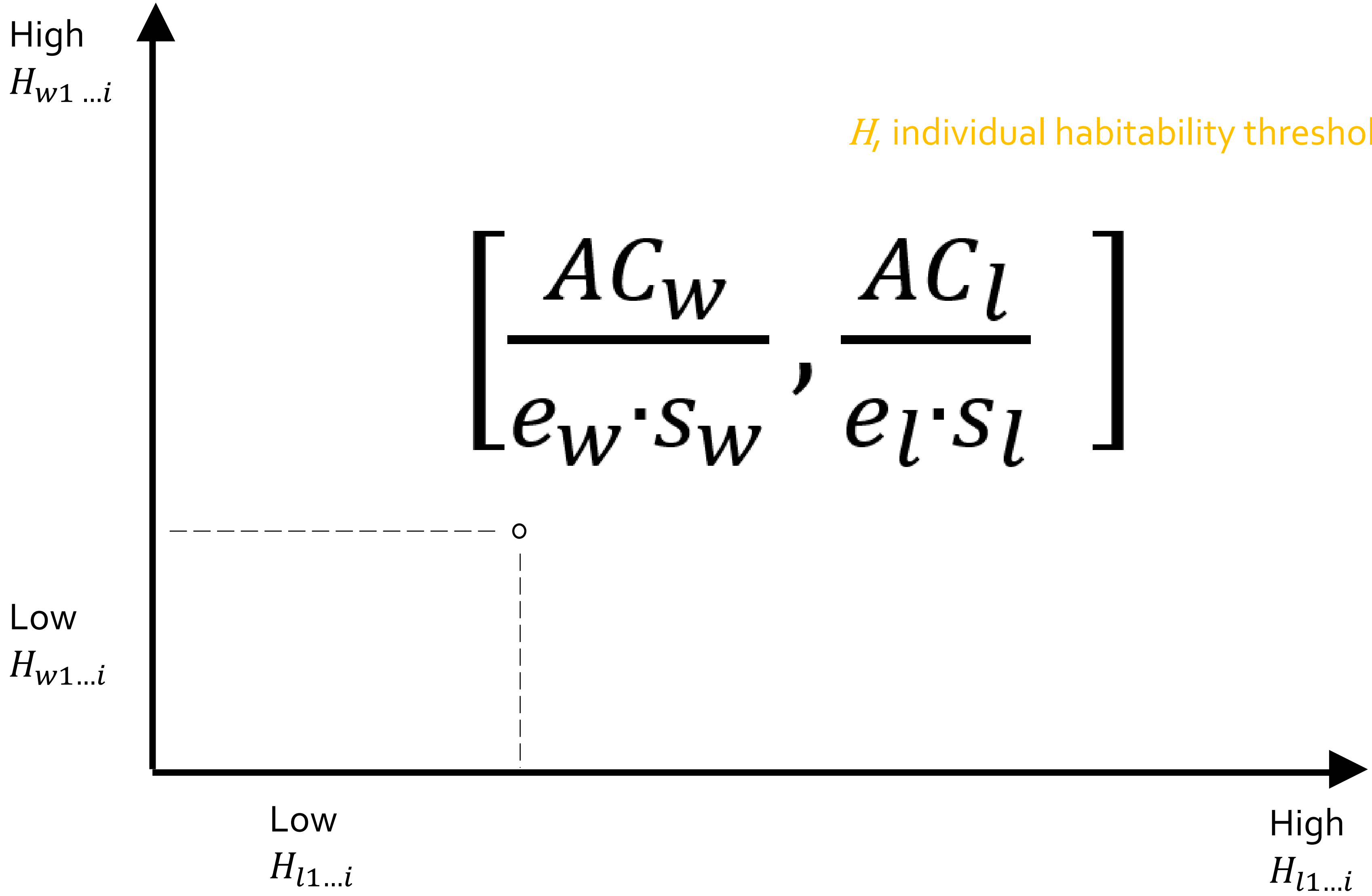


Habitability

$$H = \frac{1}{n}\sum_{i}^{n}\left[\frac{AC_w}{e_w \cdot s_w}, \frac{AC_l}{e_l \cdot s_l}\right]_i$$

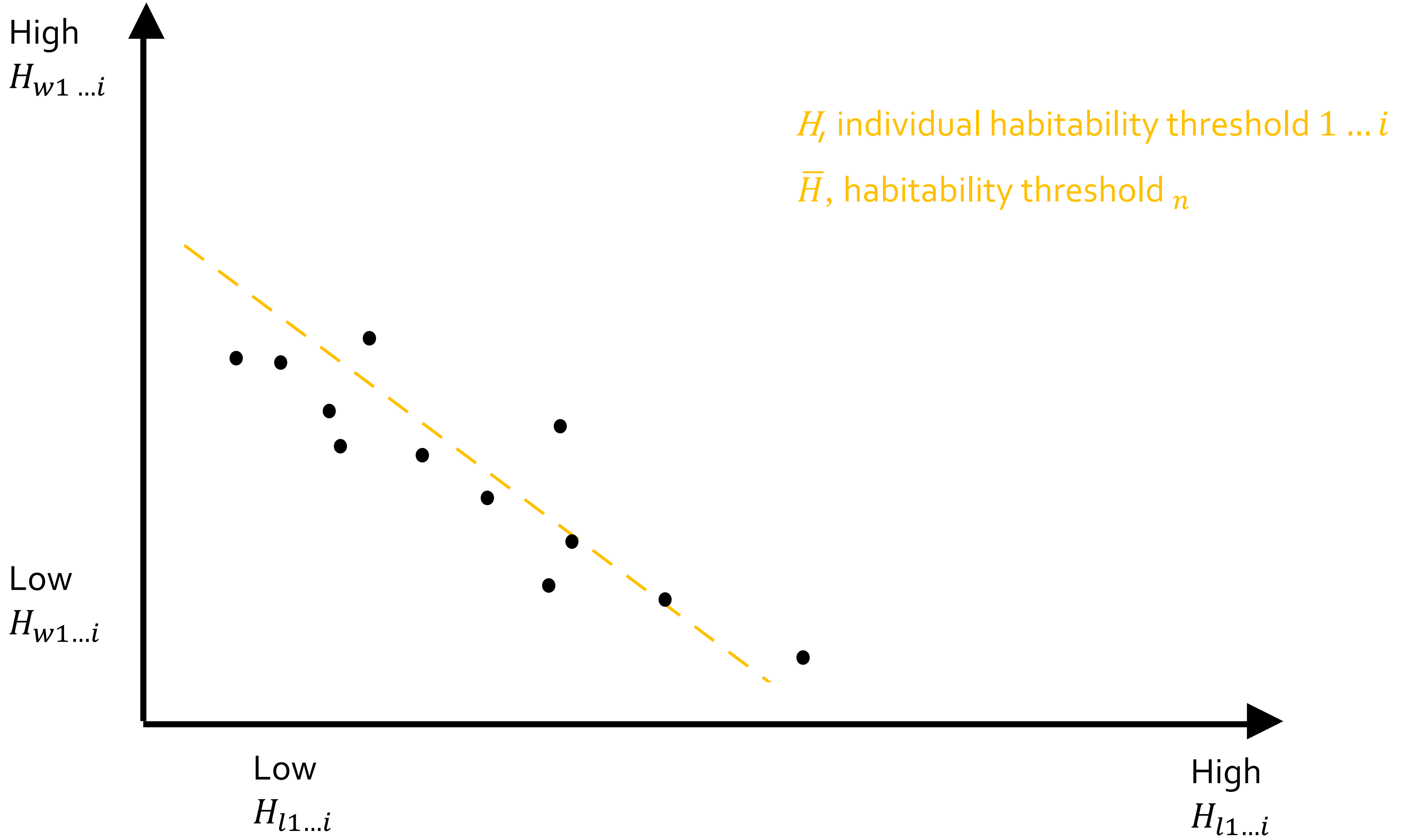
Capacity to adapt vs. adaptation limits;
Rate of adaptation vs. rate of change

Habitability Space

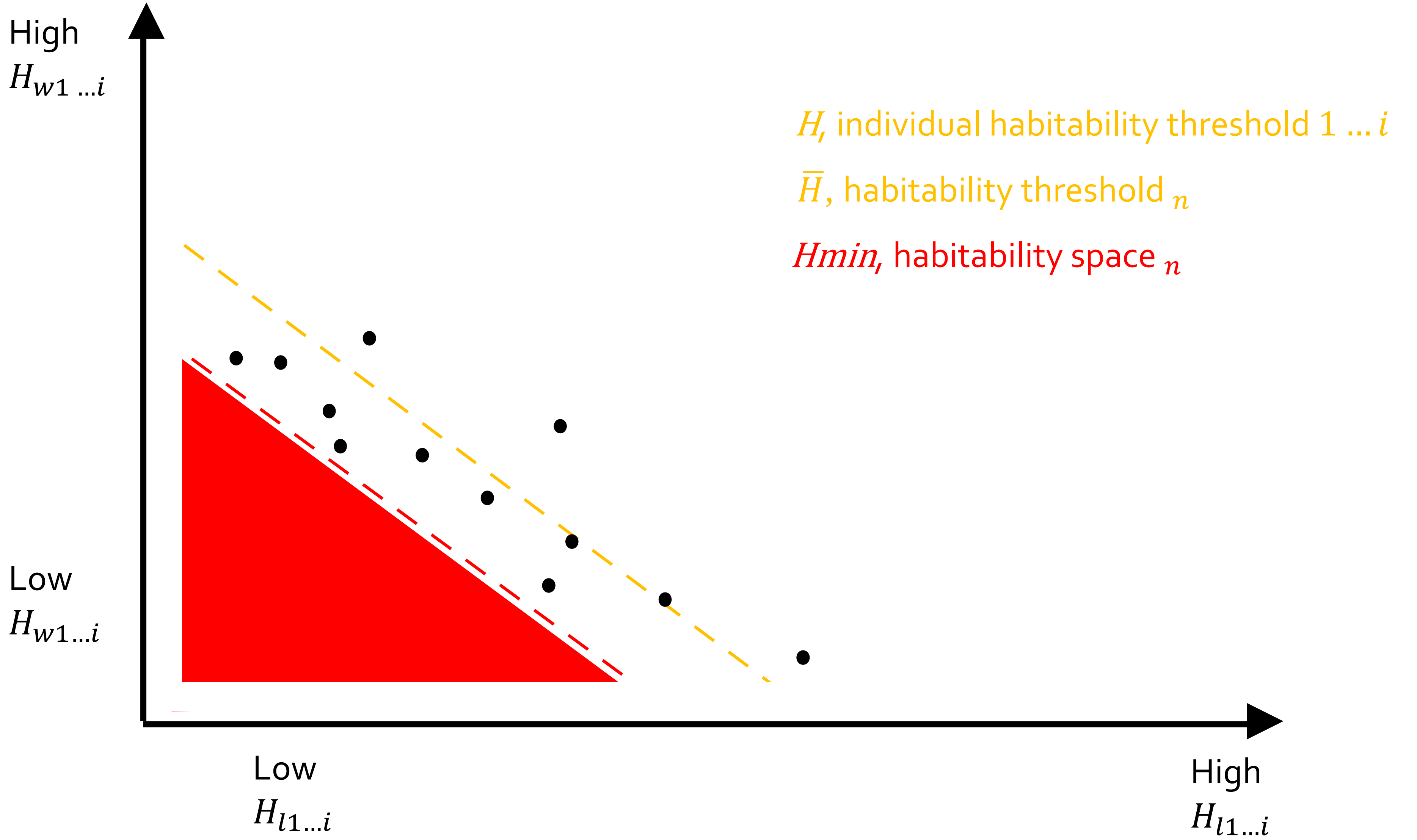


$$\left[\frac{AC_w}{e_w \cdot s_w}, \frac{AC_l}{e_l \cdot s_l}\right]$$

Habitability Space



Habitability Space



Habitability Space