以下は私がアリゾナで撮影したサワロの写真です。
今回の論文は、サワロの成立（種子が発芽し一定サイズの個体に成長すること）には、降水量（干ばつの有無）だけでなく、生育する場所の影響が大きいことを紹介しています。
※サワロ国立公園に行くと、山の斜面にサワロが多く生えていることに気づくと思います。

岩山に生えるサワロ
（アリゾナにて撮影）

The interaction of drought and habitat explain space–time patterns of establishment in saguaro (*Carnegiea gigantea*)

（サワロサボテンの成立は、干ばつと生息地の相互作用によりおおよそ決まる）

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論文の概要（英文の翻訳・意訳）：

・サワロの成立には降水量と気温の影響が大きいことがこれまでに報告されている、この研究ではランダムに選んだ**36**のスポット（各**4 ha**）において、過去の気温・降水量・現在の地形などのデータとサワロの個体数・生育量との関係性を解析することで、サワロの成立に強く影響する要因を判定している。

・その結果、①干ばつはサワロの成立に強く影響する事（実生が枯死する）、②サワロの成立には干ばつに加えて、生息地の地形の影響が大きいことが明らかとなった。

・この実験ではサワロの生息地の地形を以下の３つに分けている。
①**Bajada**（扇状地）：標高**819–919 m**、傾斜**0–3**度
②**Foothill**（小丘）：標高**897–1,058 m**、傾斜**5–17**度
③**Slope**（傾斜地）：標高**1,025–1,215 m**、傾斜**14–30**度

・干ばつ時には、**Bajada**と**Foothill**ではサワロの成立率が低いが、**Slope**では高くなった。つまり干ばつ時でも**slope**ではサワロが生育できる確率が上昇していた。

・この理由として、①傾斜地にある岩石の割れ目や岩石下に閉じ込められた土壌による保水性向上（蒸散の抑制）、②傾斜地の上部からの水の流れ（上から流れてくる水）など、こうした水分量の微環境変化が挙げられている。

The interaction of drought and habitat explain space–time patterns of establishment in saguaro (*Carnegiea gigantea*)

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詳細は原文を参照下さい。

Abstract

The long-lived columnar saguaro cactus (Carnegiea gigantea) is among the most studied plants in the world. Long-term studies have shown saguaro establishment to be generally episodic and strongly influenced by precipitation and temperature. Water limitation through lower-than-average seasonal rainfall and elevated temperatures increasing evaporative loss can reduce survivorship of recent germinates. Thus, multi-year, extended drought could cause populations to decline as older saguaros die without replacement. Previous studies have related establishment to temporal variation in rainfall, but most studies have been on non-randomized plots in ideal habitat and thus might not have captured the full variability within the local area. We studied how saguaro establishment varied in space and which habitat features may buffer responses to drought on 36 4-ha plots located randomly across an elevation gradient, including substantial replication in landscape position (bajada, foothills, and slopes) in the two disjunct districts of Saguaro National Park in southern Arizona, USA. Recent, severe drought coincided with drastic declines in saguaro establishment across this ~25,000-ha area. Establishment patterns derived from the park-wide data set was strongly correlated with drought, but the Park's two districts and diversity of plots demonstrated substantially different population outcomes. Saguaro establishment was best explained by the interaction of drought and habitat type; establishment in bajada and foothill plots dropped to near-zero under the most severe periods of water limitation but remained higher in slope plots during the same time span. Combined with saguaro density estimates, these data suggest that the most suitable habitat type for saguaro establishment shifted to higher elevations during the time span of the recent drought. These results place into context the extent to which historical patterns of demography provide insight into future population dynamics in a changing climate and reveal the importance of understanding dynamics across the distribution of possible local habitat types with response to variation in weather.