

2008年11月18日

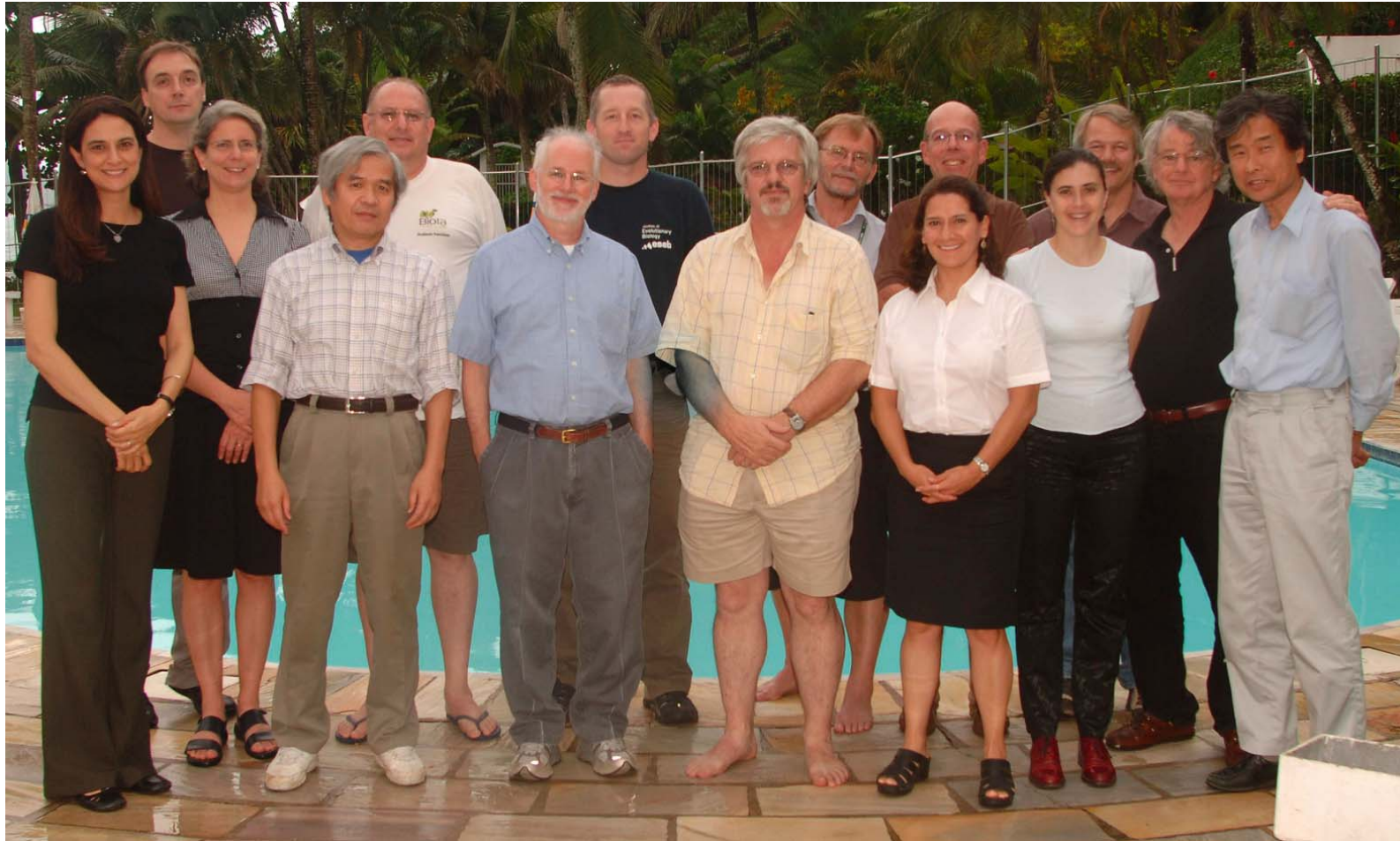
生態学 I 第5回

最適採餌戦略

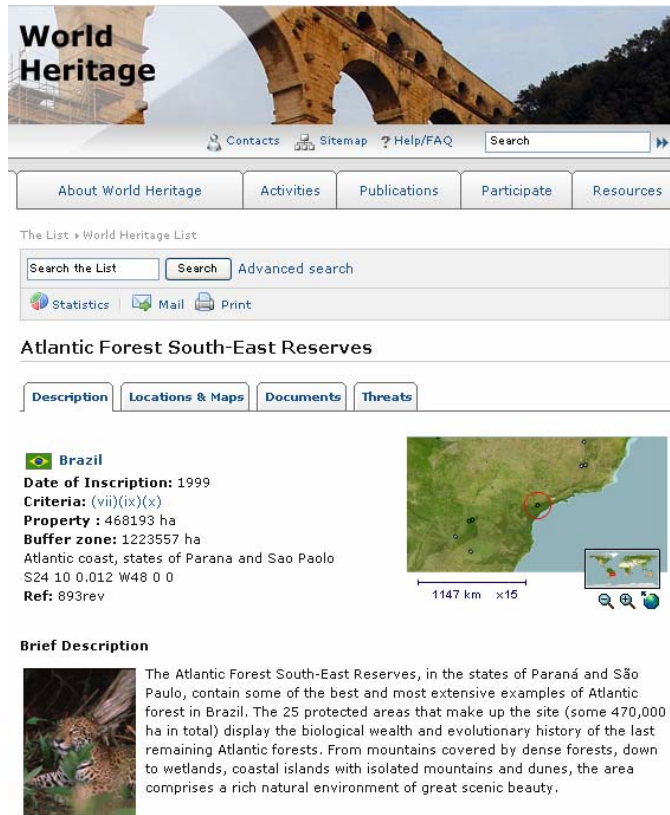
(サンパウロ州Atlantic Forestの紹介)

いかに効率よく餌を集めるか？

DIVERSITAS bioGENESIS 科学委員会



Atlantic Forest



World Heritage

Contacts Sitemap Help/FAQ Search

About World Heritage Activities Publications Participate Resources


The List » World Heritage List

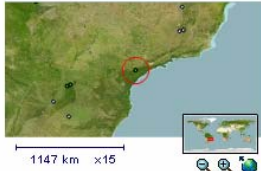
Search the List Search Advanced search

Statistics Mail Print

Atlantic Forest South-East Reserves


Description Locations & Maps Documents Threats

 **Brazil**
Date of Inscription: 1999
Criteria: (vii)(ix)(x)
Property : 468193 ha
Buffer zone: 1223557 ha
Atlantic coast, states of Paraná and São Paulo
S24 10 0.012 W48 0 0
Ref: 893rev



1147 km x15

Brief Description



The Atlantic Forest South-East Reserves, in the states of Paraná and São Paulo, contain some of the best and most extensive examples of Atlantic forest in Brazil. The 25 protected areas that make up the site (some 470,000 ha in total) display the biological wealth and evolutionary history of the last remaining Atlantic forests. From mountains covered by dense forests, down to wetlands, coastal islands with isolated mountains and dunes, the area comprises a rich natural environment of great scenic beauty.



E-News | Contact Us | Site Credits | Site Map

BIODIVERSITY HOTSPOTS

HOTSPOTS SCIENCE | HOTSPOTS BY REGION | RESOURCES

Jump to Hotspot

ATLANTIC FOREST

The Atlantic Forest of tropical South America boasts 20,000 plant species, 40 percent of which are endemic. Yet, less than 10 percent of the forest remains. More than two dozen Critically Endangered vertebrate species are clinging to survival in the region, including three species of lion tamarins and six bird species that are restricted to the small patch of forest near the Murici Ecological Station in northeastern Brazil. With almost 950 kinds of birds occurring in this hotspot, there are many unique species including the red-billed curassow, the Brazilian merganser, and numerous threatened parrot species.

Beginning with sugarcane plantations and later, coffee plantations, this region has been losing habitat for hundreds of years. Now, with the increased expansion of Rio de Janeiro and São Paulo, the Atlantic Forest is facing severe pressure from the issues tied to urbanization.



BRAZIL

BOLIVIA

PARAGUAY

ARGENTINA

URUGUAY

Sao Paulo

ATLANTIC OCEAN

0 600 Kilometers

CI / CABS

亞熱帶低地林



雲霧林 cloud forest



Understory flowers



ヒメハギ科の一種



イワタバコ科の一種

Understory flowers

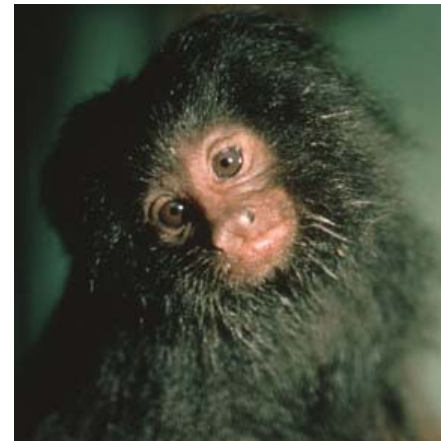


アカネ科の一種



キツネノマゴ科の一種

Atlantic forest の猿: 24種



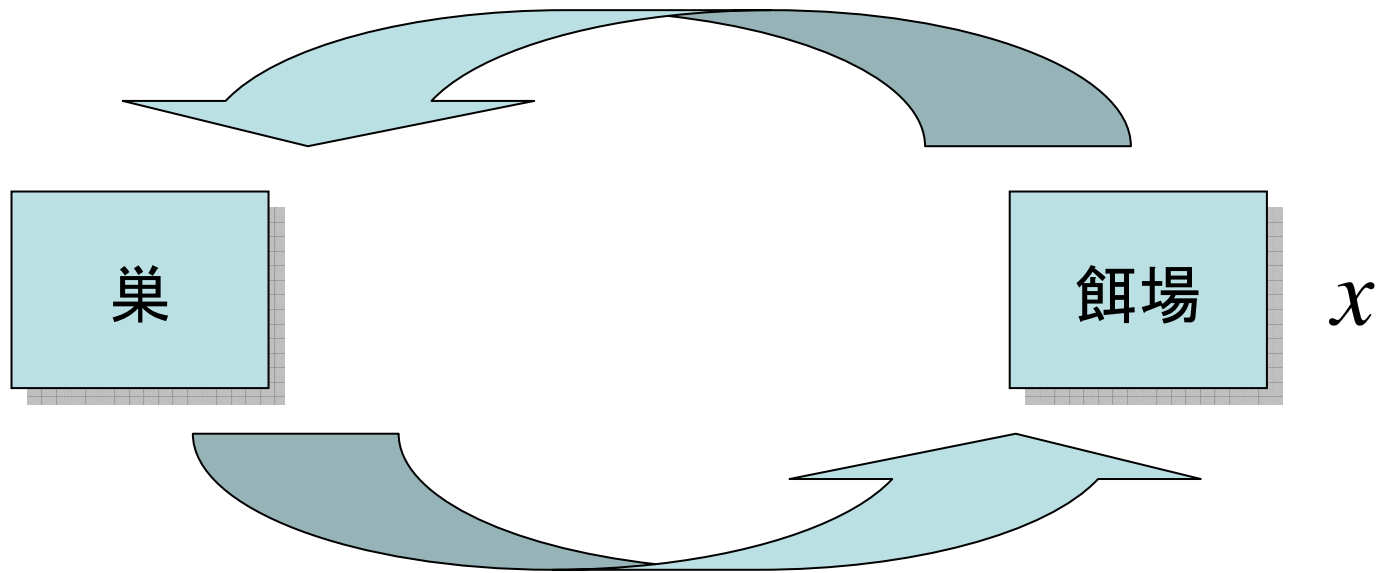
<http://www.biodiversityscience.org/publications/hotspots/Atlanticforest.html>

Atlantic forest の鳥



http://www.tropicalbirding.com/trip/Reports/TR_Brazil_Jun2005.html

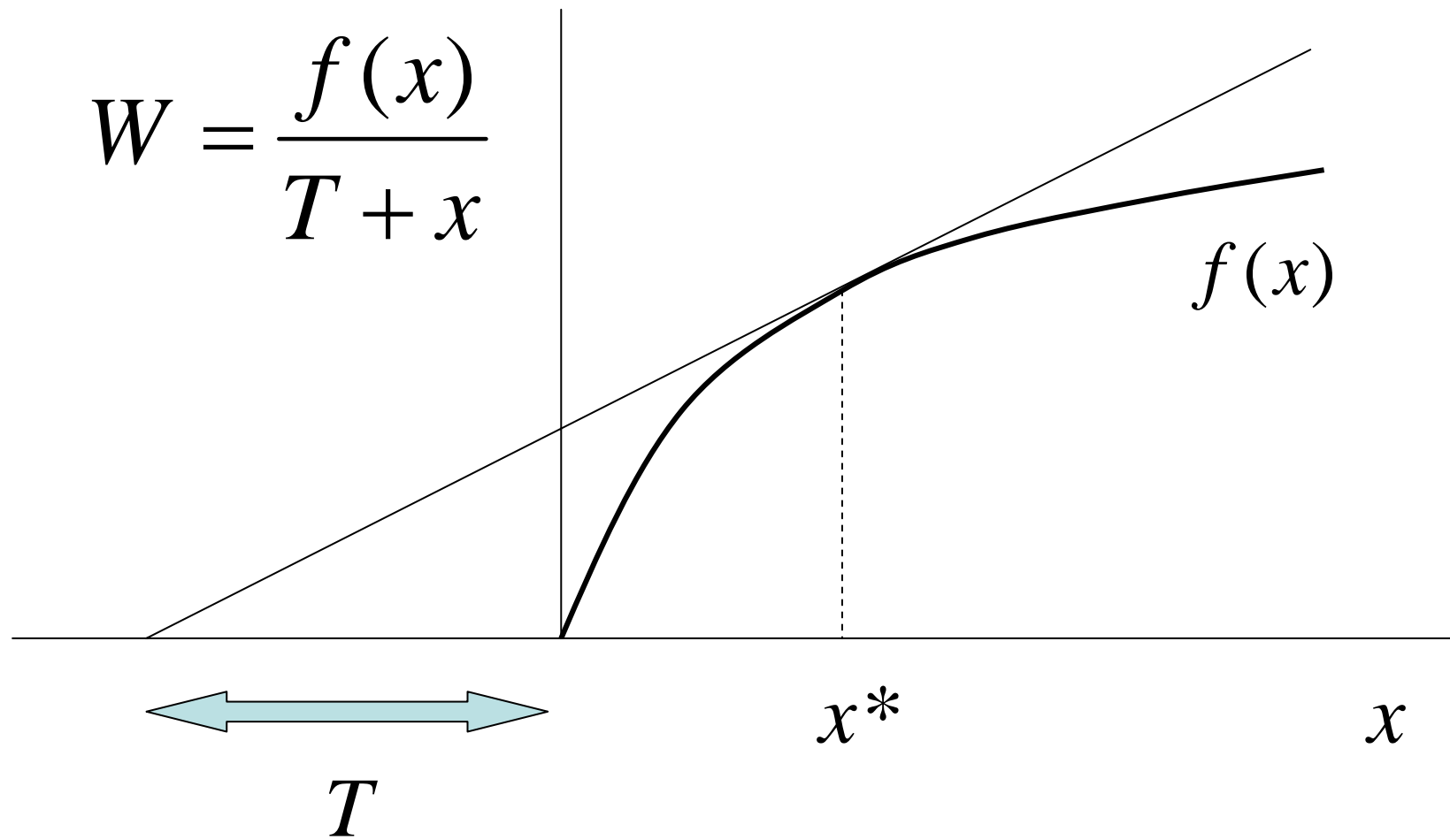
最適採餌戦略



T

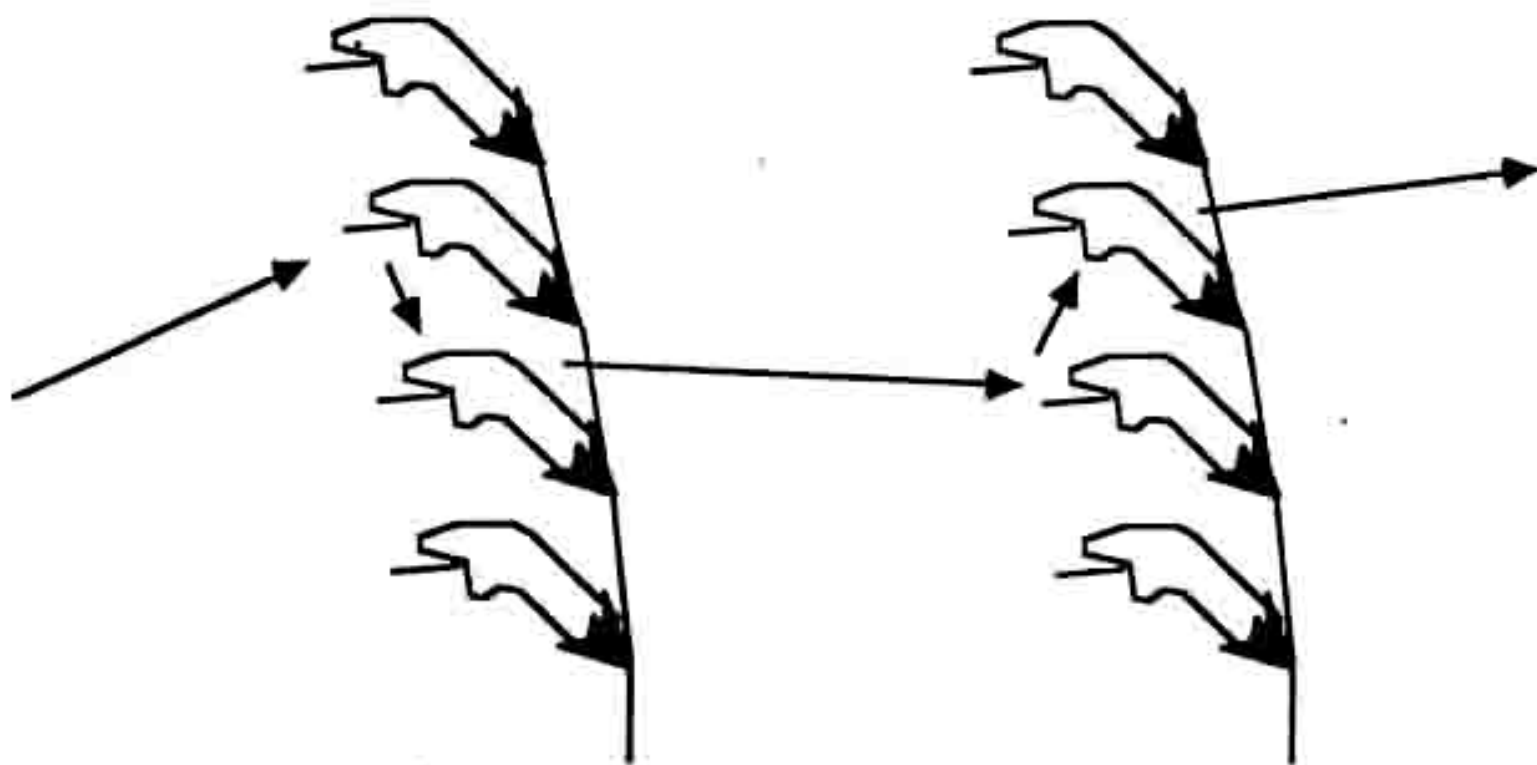
餌場にどれだけ長く滞在して餌をとるのが最適か？

最適採餌戦略



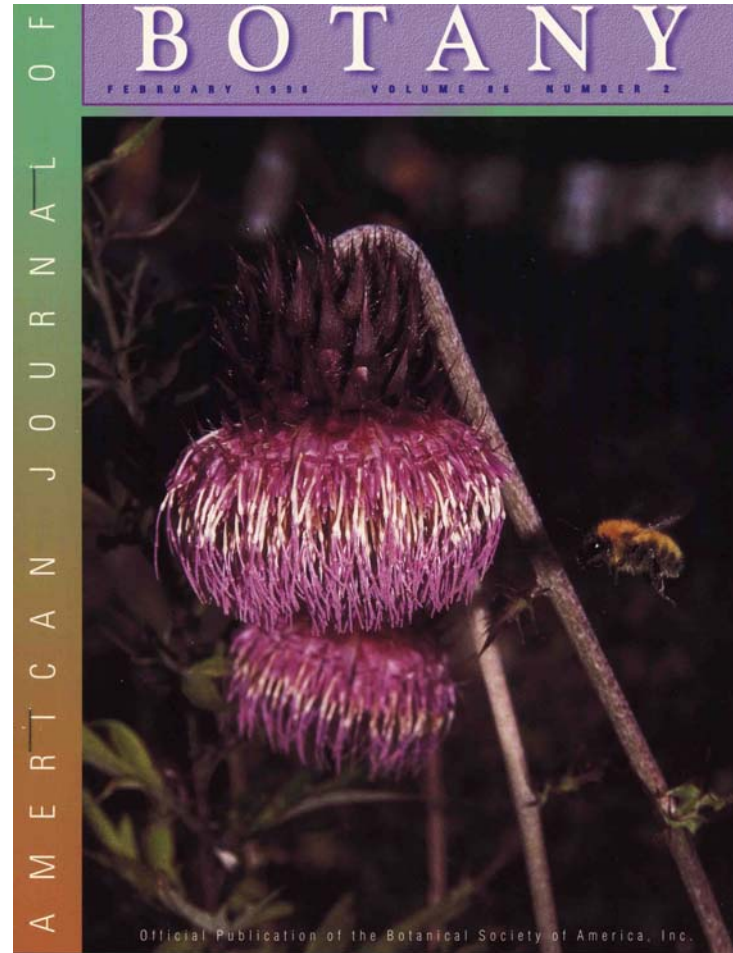
ポリネータの不可思議な（一見非適応的な）行動

株の中の一部の花だけを吸蜜し、次の株へ移動



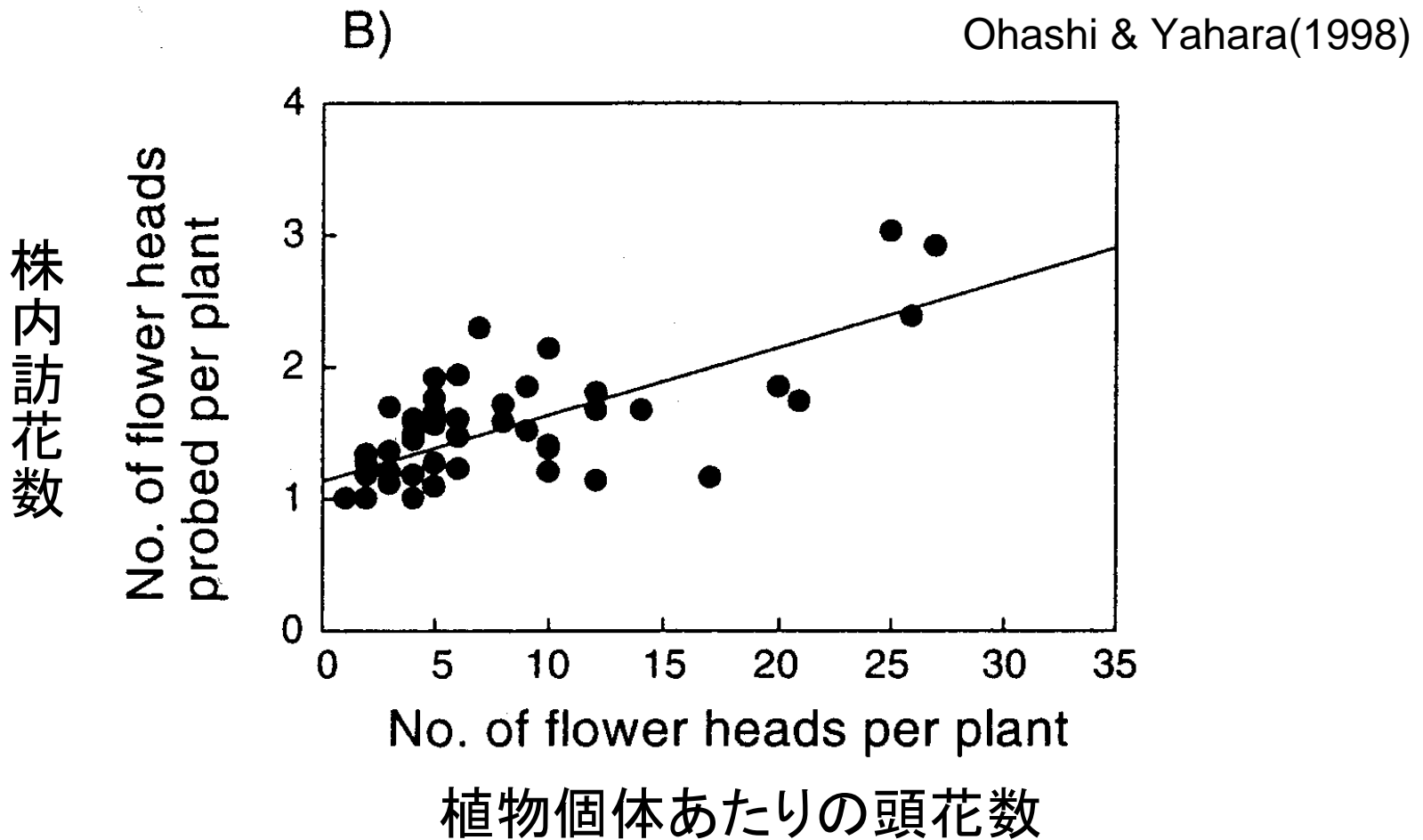
植物にとっては隣花受粉を少なくする有益な効果

フジアザミとトラマルハナバチ

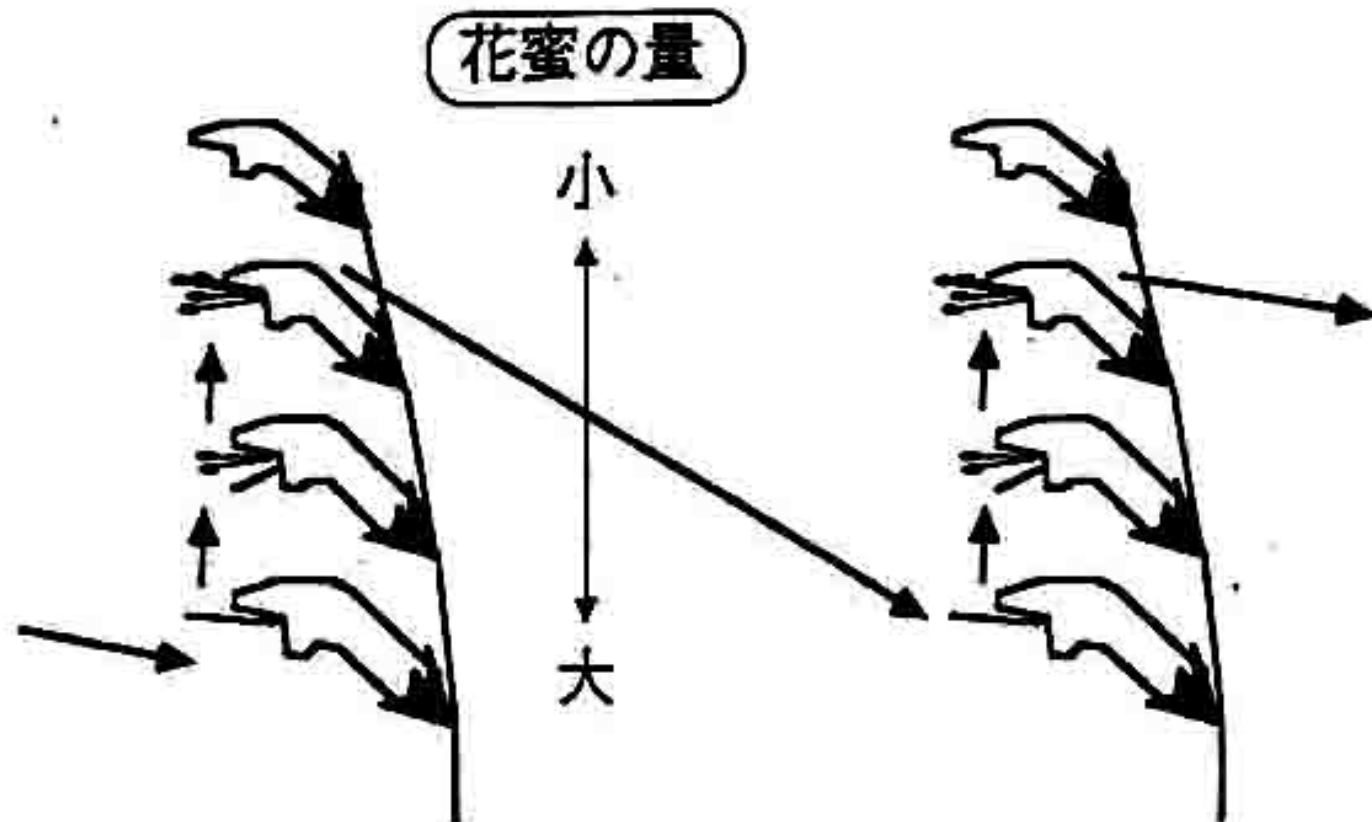


Ohashi & Yahara(1998)
Amer J Bot 85:219-224

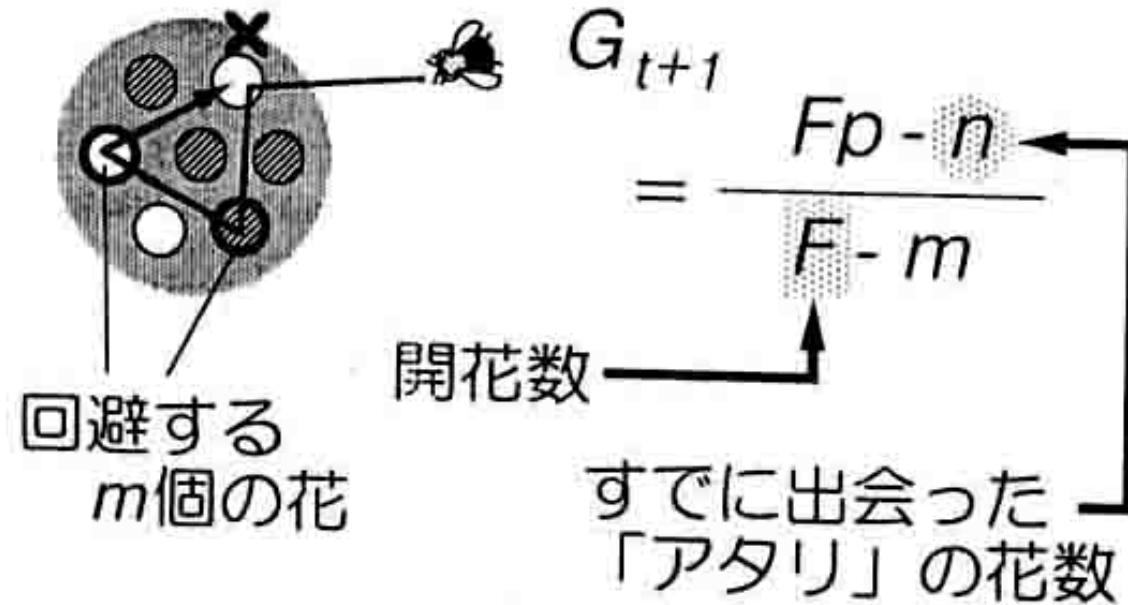
フジアザミの花数とトラマルハナバチの株内訪花数の関係



ポリネータを操る花の戦略：花の位置が覚えやすい場合



Ohashi & Yahara model



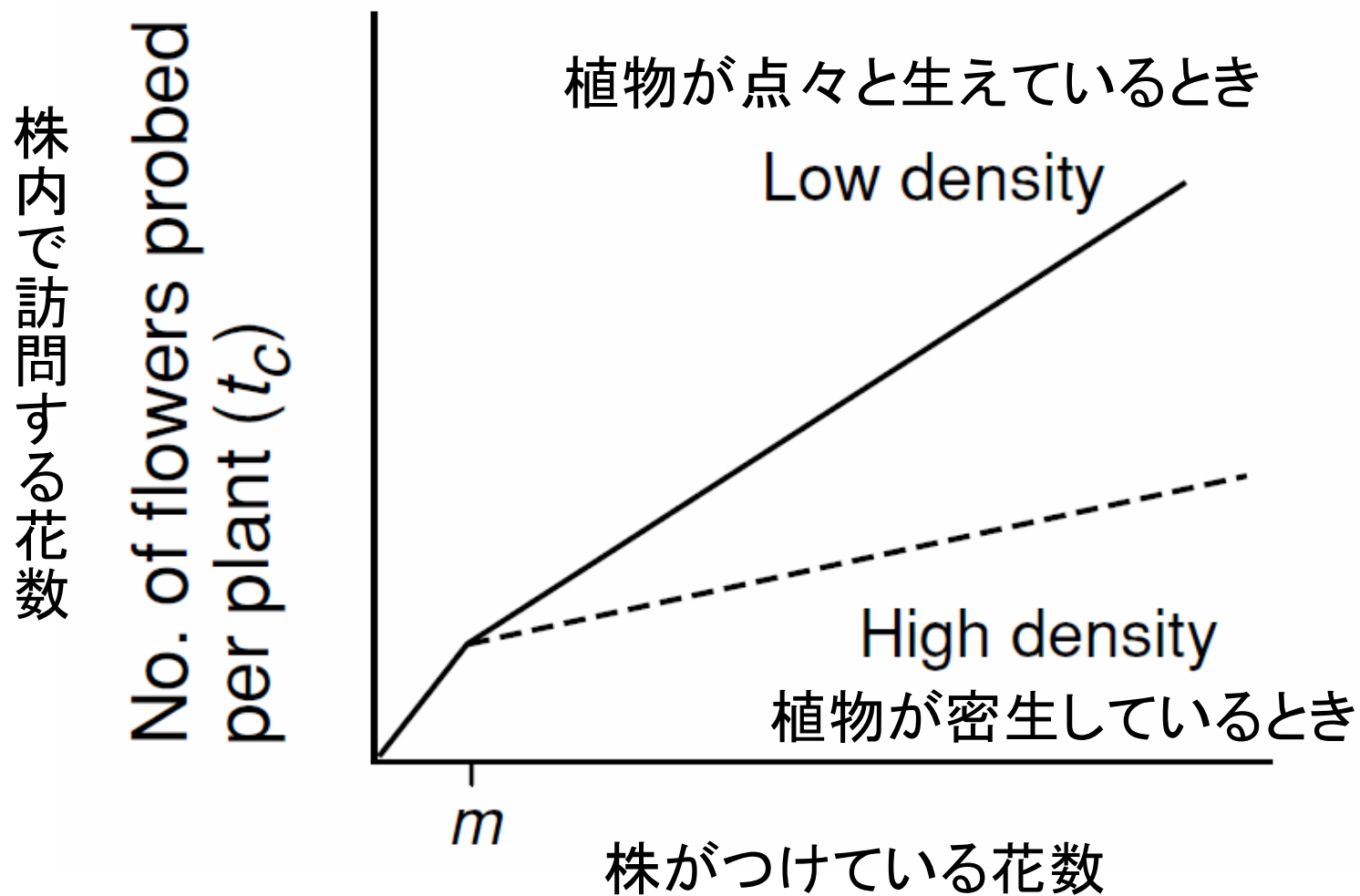
m は短期記憶
の上限値

境界は

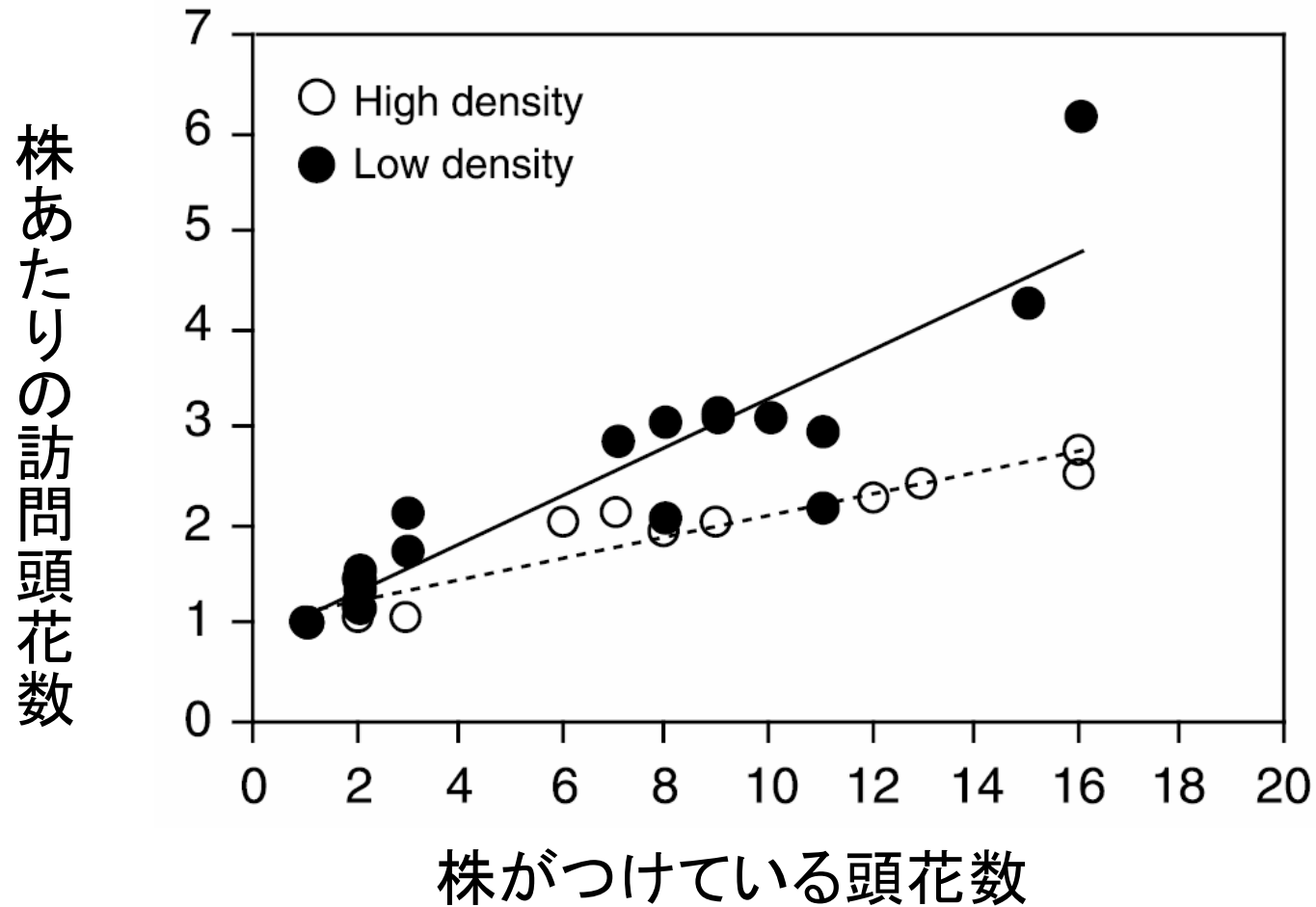
$$\frac{Fp - n}{F - m} = kp$$

立ち去り条件は $G_{t+1} < kp$

Ohashi & Yahara モデルの予測



マルハナバチの訪花パターン



キバナアキギリのおしべ付属体の除去実験

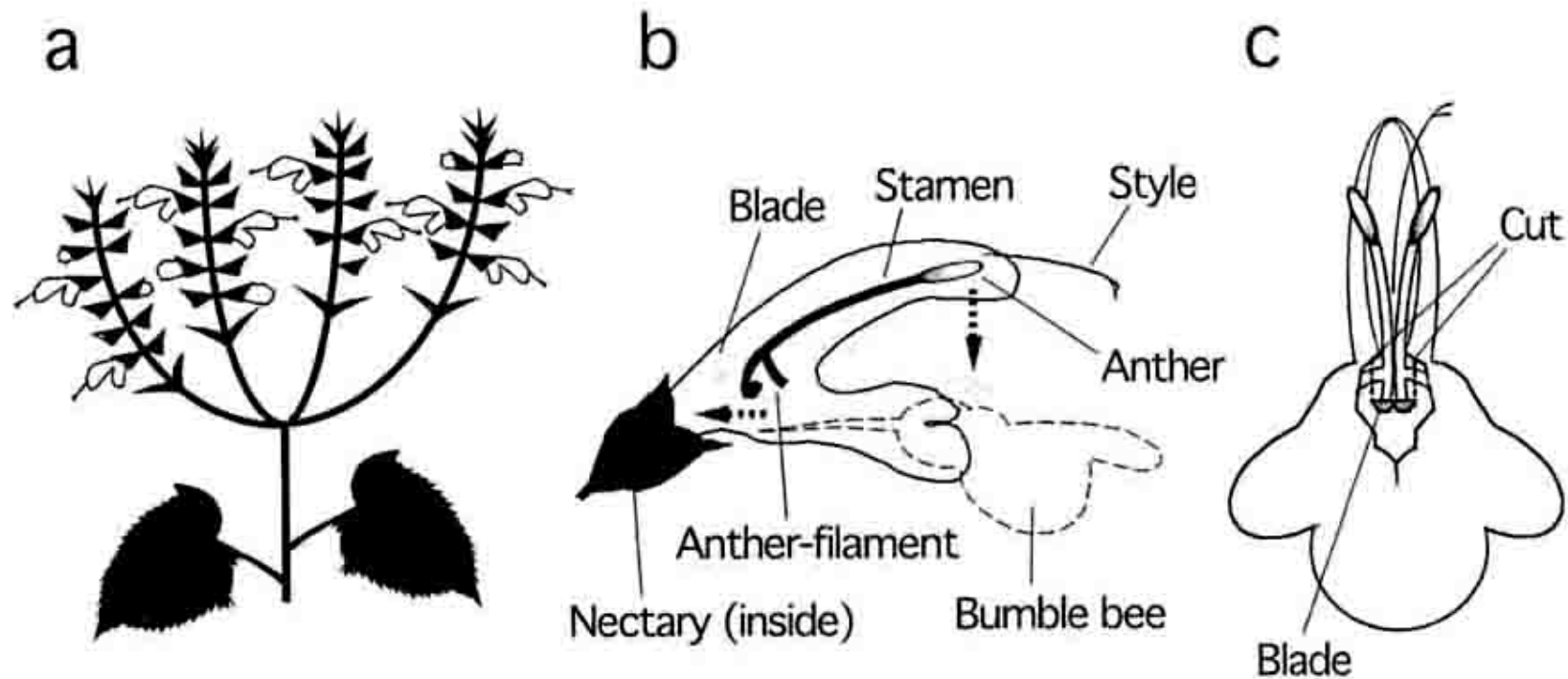
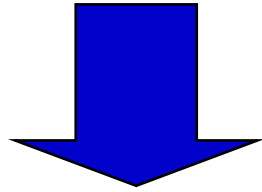


FIG. 1. Views of *Salvia nipponica*. (a) Flowering plant with four racemes, each of which bears two or three open flowers and no or two buds. (b) Half-section of a flower, showing the broadened lower end and the fertile anther cell on the upper end of one of the two fully developed anthers. Arrows and gray-colored stamen indicate the movement of the see-saw mechanism when a bee (dashed line) crawls into the flower. Immediately after the bee leaves the flower, the elastic stamen swings up into upper lips (see text). (c) Front view of a flower. The broken lines are the location of cutting for stamen-removal treatment.

移動コスト(k)

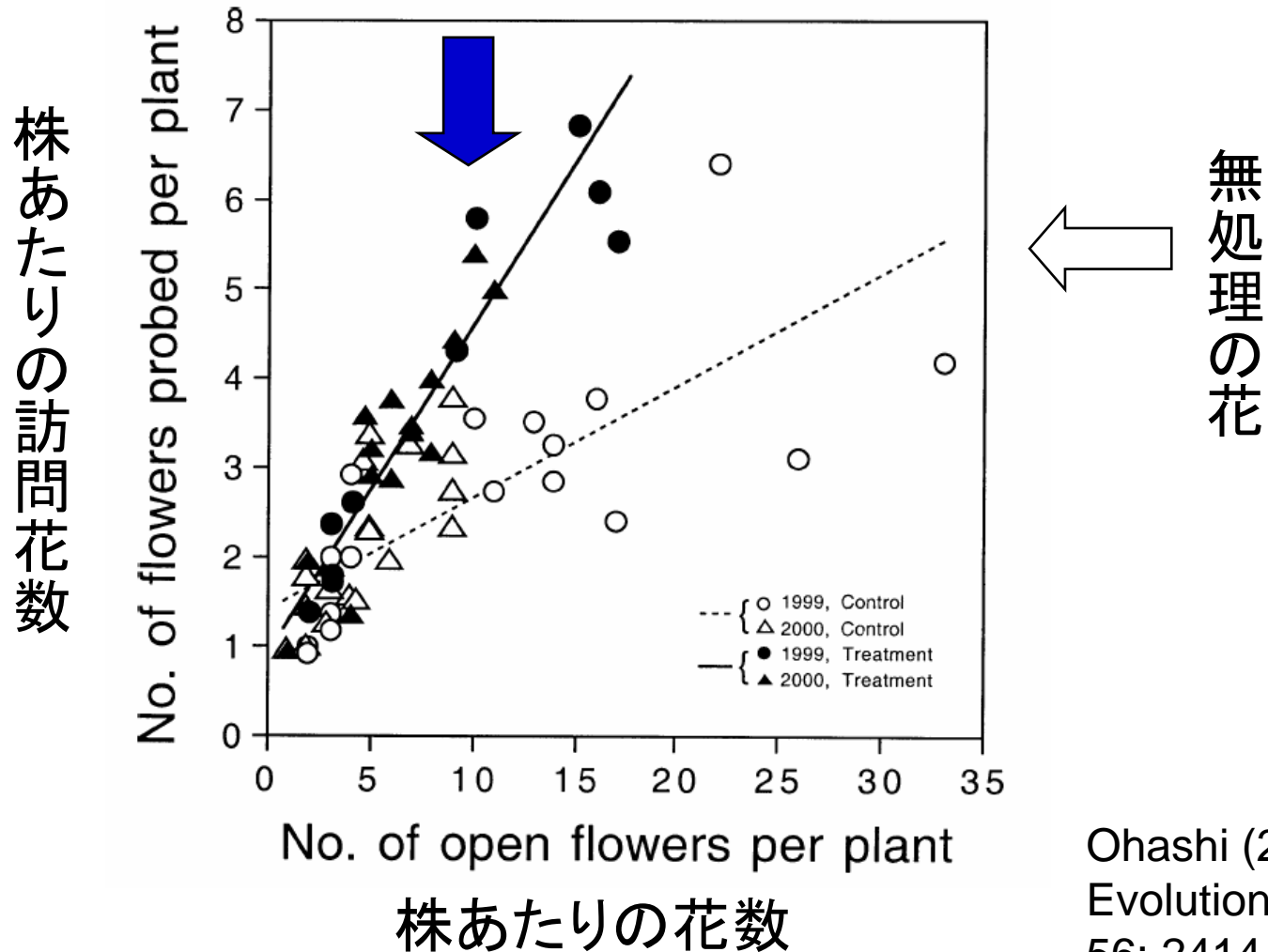
花あたり処理時間	+	株内移動時間
花あたり処理時間	+	株間移動時間



花あたり処理時間を大きくすれば、
株を早く立ち去るはずである

キバナアキギリへのマルハナバチの訪花行動

付属体を除去してもぐりやすくした花



Ohashi (2002)
Evolution
56: 2414-2423

切花をつかった訪問実験



好まれる頭花と嫌われる頭花



ほのかな甘い香り



くさった魚の臭い

マルハナバチは自分の臭いを嫌う

Goulson et al. 2000

2906

GOULSON, STOUT, LANGLEY, AND HUGHES

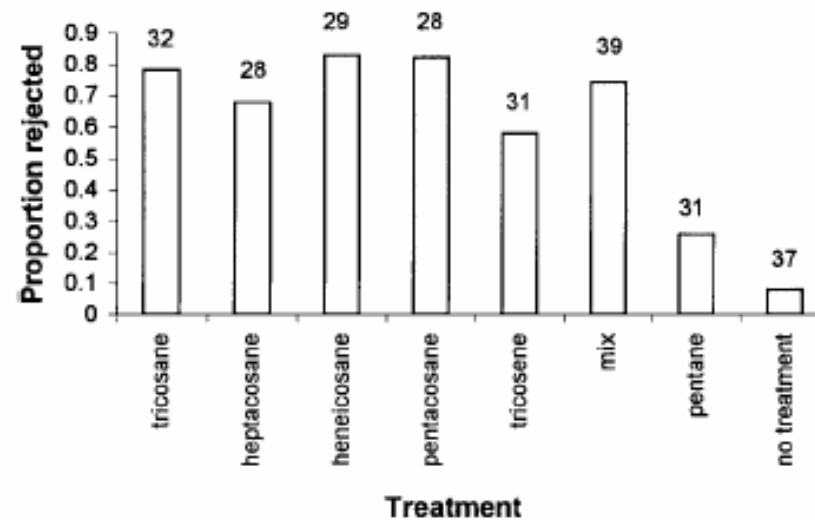


FIG. 3. The proportion of *B. lapidarius* workers rejecting *M. officinalis* flowers treated with 1×10^{-12} μg of different compounds diluted in $5 \mu\text{l}$ of pentane, with $5 \mu\text{l}$ of pentane alone, or with nothing. Doses given are milligrams per flower. Numbers above the bars represent sample sizes.

ではなぜ同じ花にすぐに再訪問するのか？

今日のキーポイント

- 動物の最適時間配分
 - 収穫量が最大になるように行動しても効率は低下する
 - 送粉昆虫の最適戦略は植物の性質によって変化する
- 送粉動物と植物の関係
 - 「最適な状態」は、送粉昆虫と花(植物)との間で異なる・・・「利害」の不一致
 - 進化的に安定な状態は「妥協点」