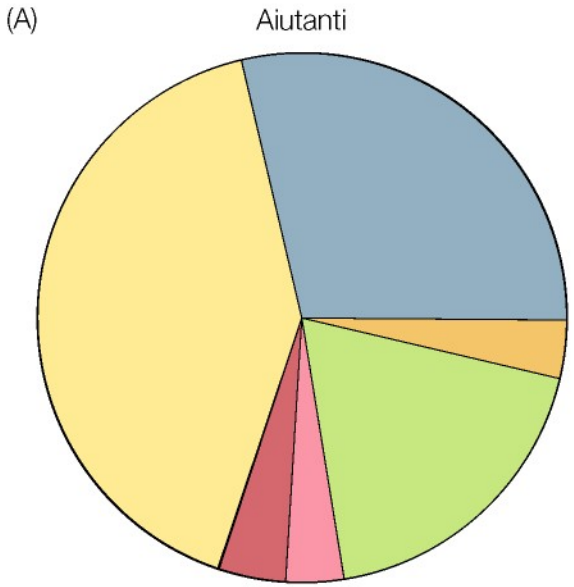


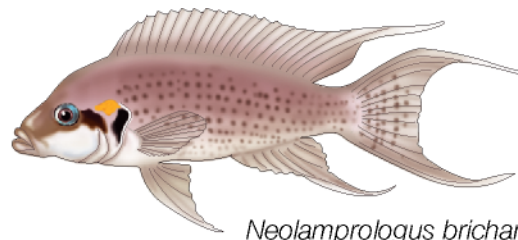
# L'evoluzione del comportamento sociale

**TABLE 13.1** *Some potential costs and benefits of social living*

<b>Costs</b>	<b>Benefits</b>
Greater conspicuousness of clumped individuals to predators	Defense against predators via the dilution effect or via mutual defense (see Chapter 6)
Greater transmission of disease and parasites among group members	Opportunities to receive assistance from others in dealing with pathogens
More competition for food among group members	Improved foraging via the information center effect (see Chapter 7)
Time and energy expended by subordinates in dealing with more dominant companions	Subordinates are granted permission to remain safely within the group
Greater male vulnerability to cuckoldry	Opportunity for some males to cuckold others
Greater female vulnerability to egg tossing, egg dumping, and other forms of reproductive interference by companions	Opportunity to toss the eggs of others, dump eggs in others' nests, and interfere with the reproduction of competitors

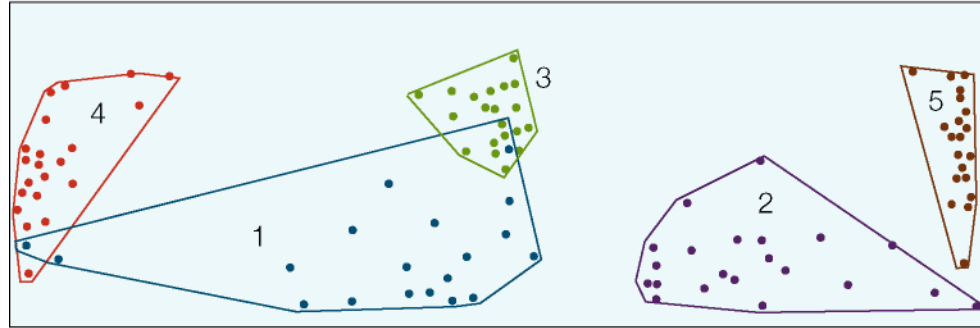


Comportamenti sociali	{	Comportamento agonistico
	{	Comportamento di sottomissione
Cura diretta della covata		Pulizia delle uova
Mantenimento del territorio	{	Pulizia del fondo
	{	Scavo
	{	Trasporto

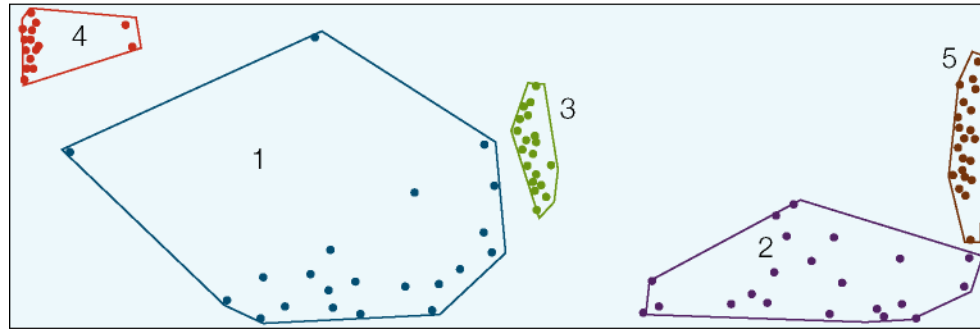


*Neolamprologus brichardi*

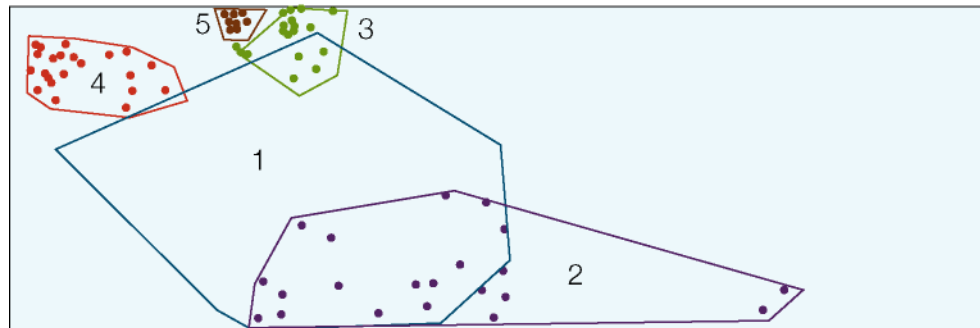
Giorno 1



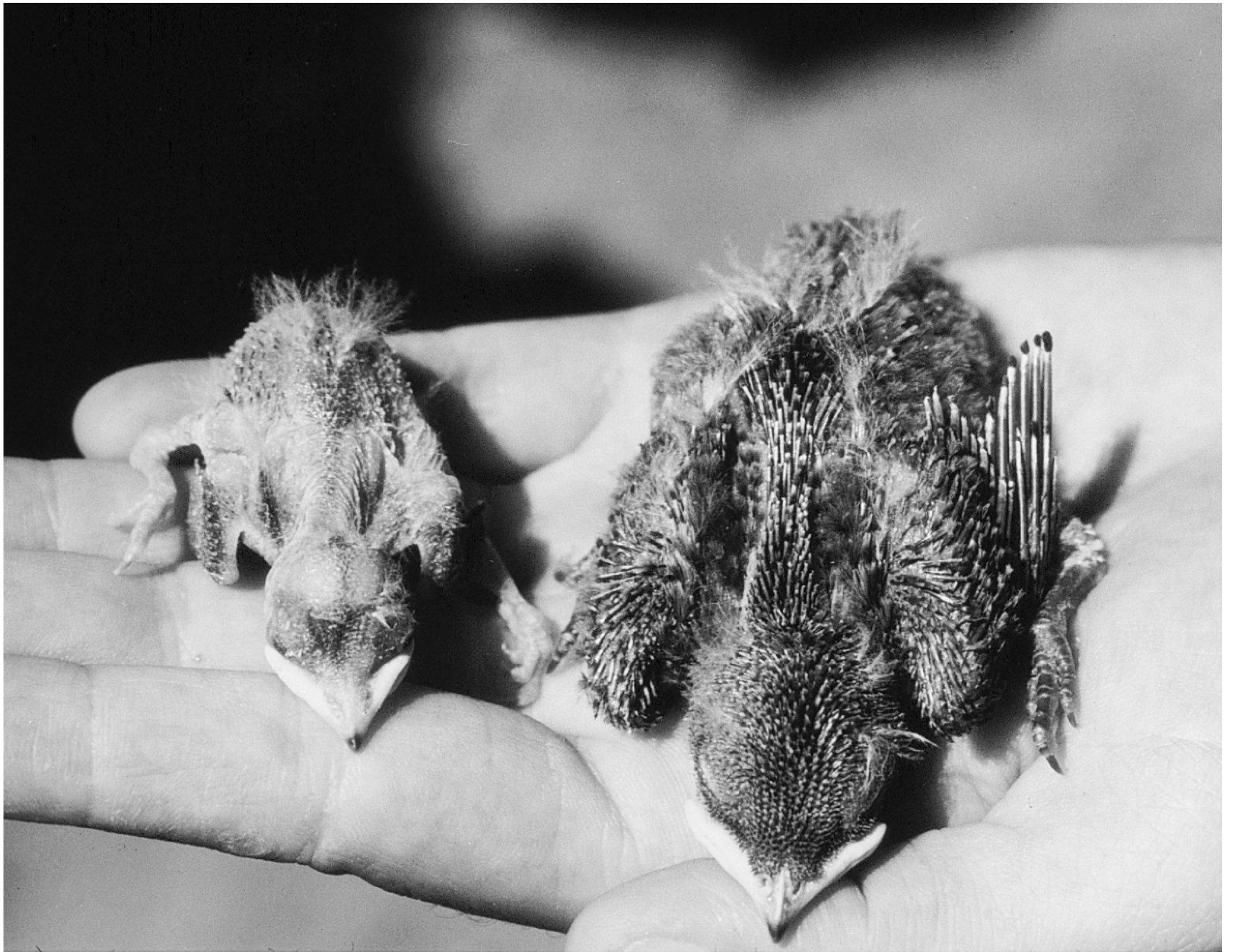
Giorno 2



Giorno 3









**TABLE 13.2** *The direct reproductive success of individuals that engage in different kinds of social interactions*

Type of interaction	Effect on direct reproductive success of	
	Social donor	Social recipient
Mutualism (Cooperation)	+	+
Reciprocity	+ (delayed)	+
Altruism	–	+
Selfish behavior	+	–
Spiteful behavior <sup>a</sup>	–	–

<sup>a</sup>You should not be surprised that spiteful behavior is almost never observed in nature; you should be surprised that altruism is not uncommon despite the loss of reproductive success experienced by altruists.



## Mutualismo

Guadagno condiviso di fitness diretta  
Esempio: cattura della preda da parte di una leonessa

## Reciprocità

Guadagno di fitness diretta ritardato (in funzione della ricompensa)  
Esempio: scambio di sangue fra vampiri

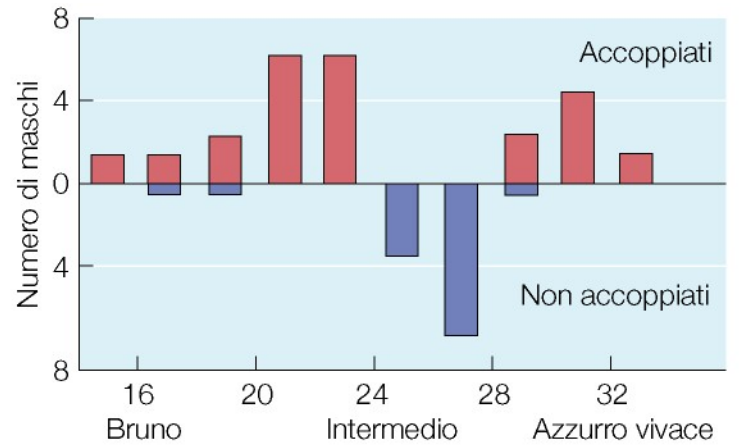
AIUTANTI

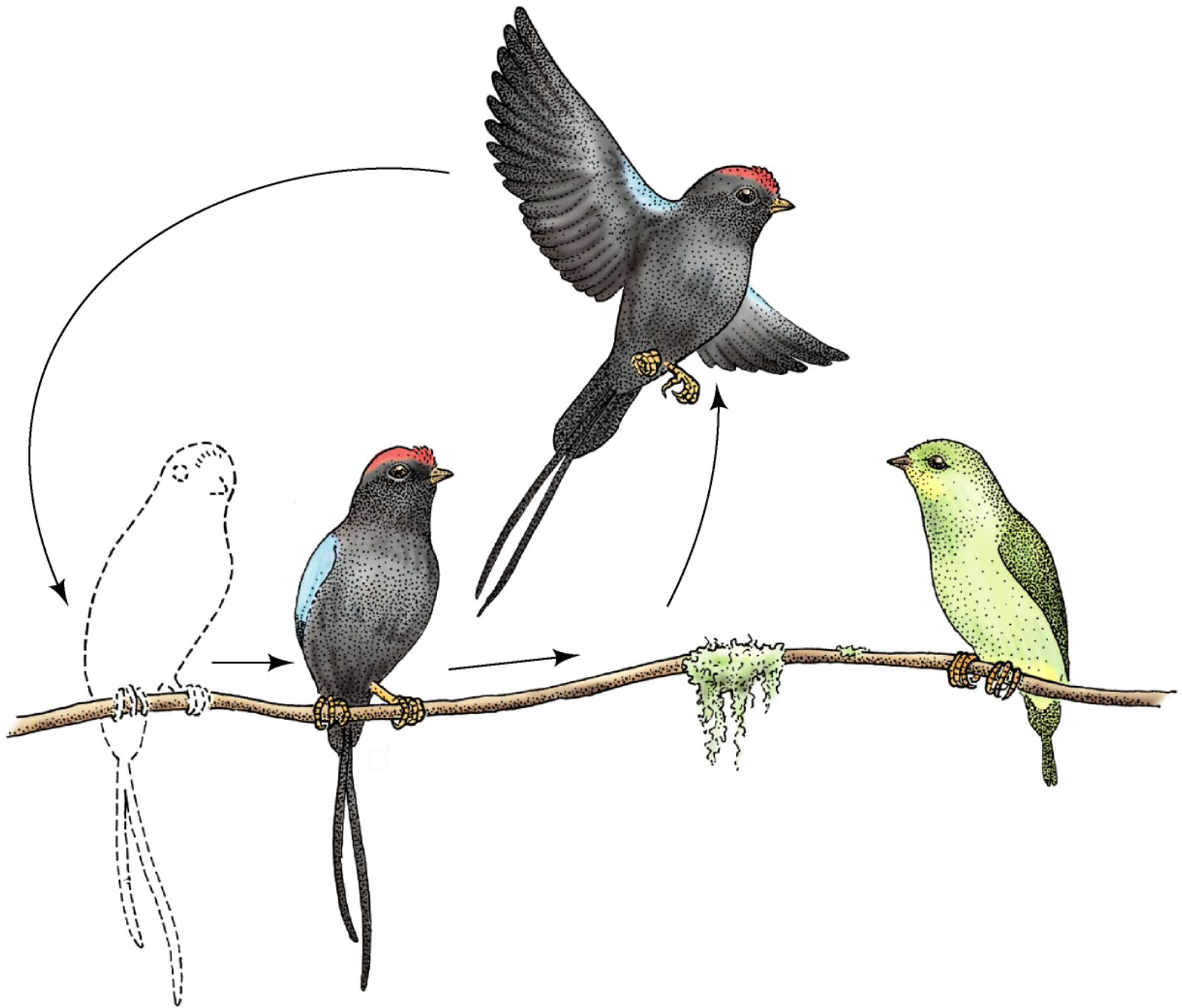
## Altruismo obbligato

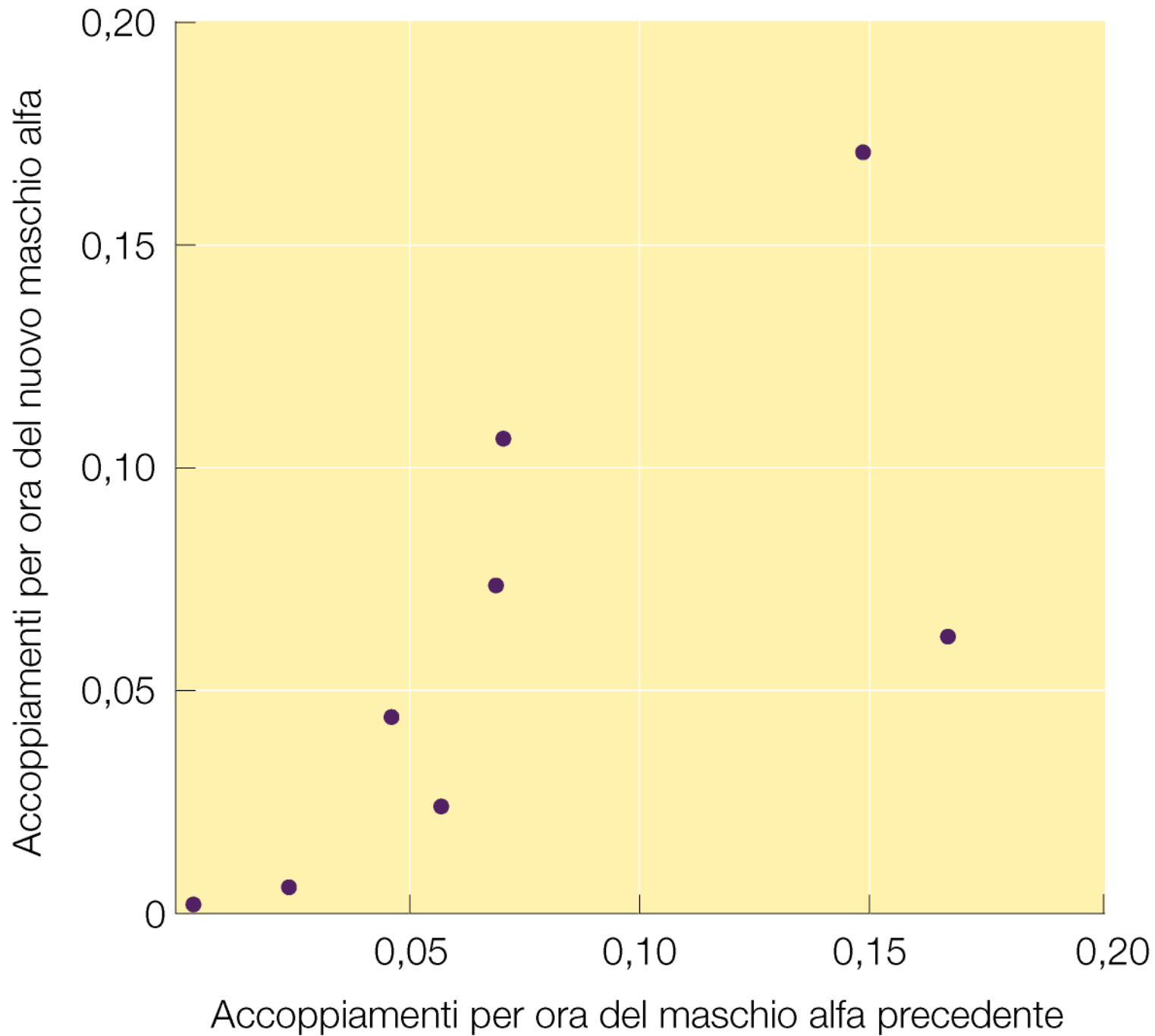
Perdita permanente di fitness diretta (con potenziale guadagno di fitness indiretta)  
Esempio: api che foraggiano per la colonia

## Altruismo facoltativo

Perdita temporanea di fitness diretta (con potenziale guadagno di fitness indiretta seguito dalla riproduzione personale)  
Esempio: ghiandaia di macchia della Florida che aiuta al nido e poi eredita il territorio dei genitori







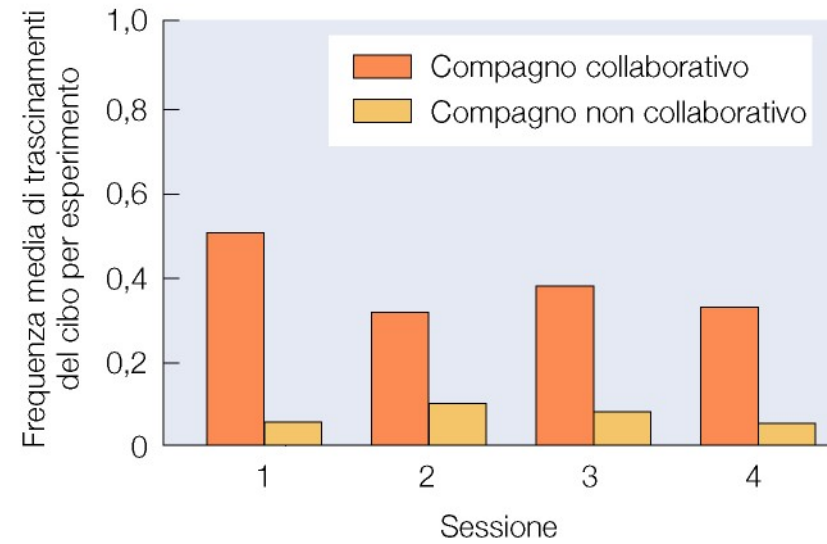




(A)



(B)



Individuo B

Collabora

Tradisce

Collabora

Ricompensa per mutua  
collaborazione  
(1 anno in prigione)

Massima  
punizione  
(10 anni in prigione)

Individuo A

Tradisce

Massima ricompensa  
(libertà)

Punizione  
per mutuo tradimento  
(5 anni in prigione)



(A)

L'INDIVIDUO SI RIPRODUCE

**Selezione diretta**

→  $\left[ \begin{array}{l} N_1 \text{ sopravvive senza cure parentali} \\ N_2 \text{ sopravvive grazie a cure parentali} \end{array} \right.$

L'INDIVIDUO AIUTA I PROPRI PARENTI

**Selezione indiretta**

→  $N_3 \text{ sopravvive grazie all'aiuto ricevuto}$

**Selezione  
di parentela**

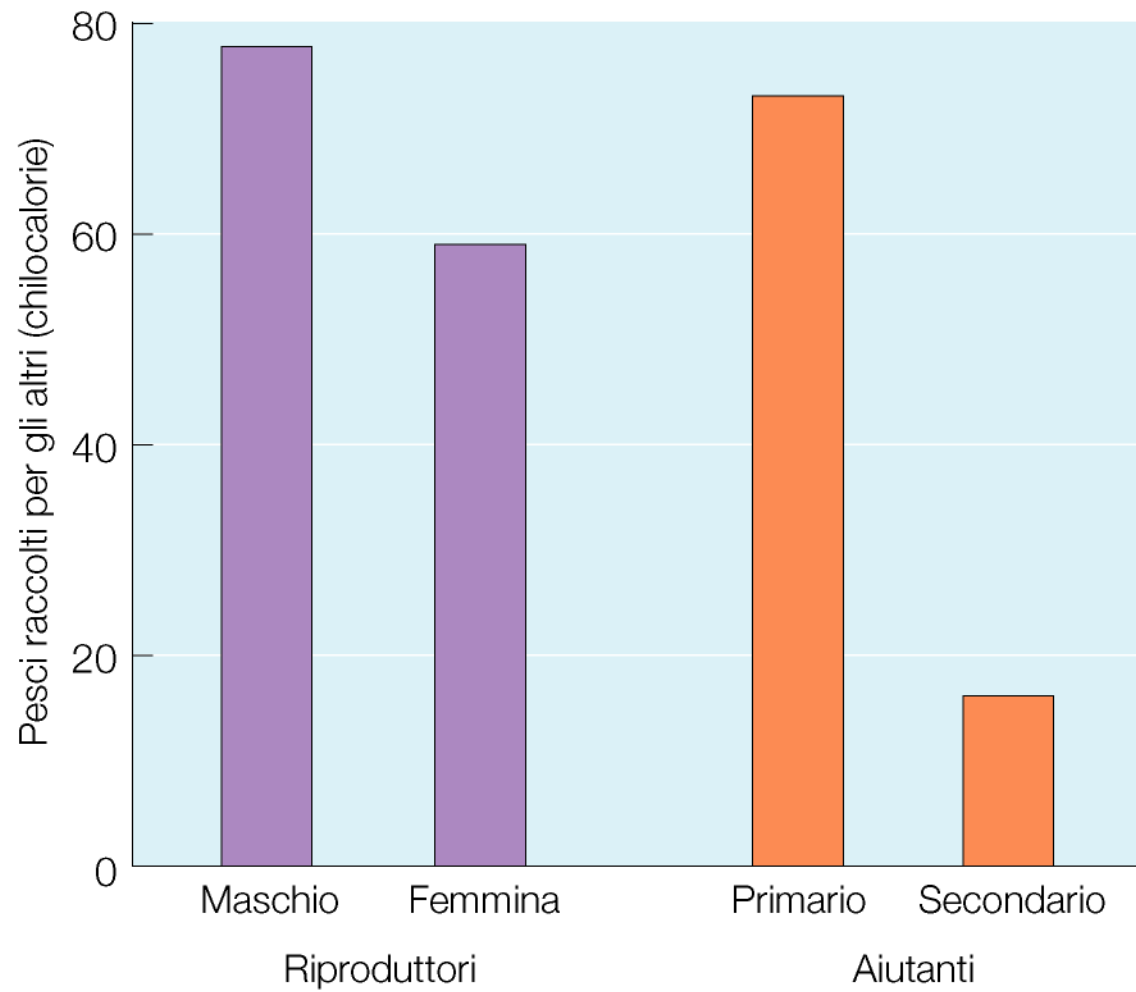
(B)

**Fitness diretta** =  $(N_1 \times r) + (N_2 \times r)$

**Fitness indiretta** =  $N_3 \times r$

→ **Fitness complessiva**





**TABLE 13.3** *Calculations of inclusive fitness for male pied kingfishers*

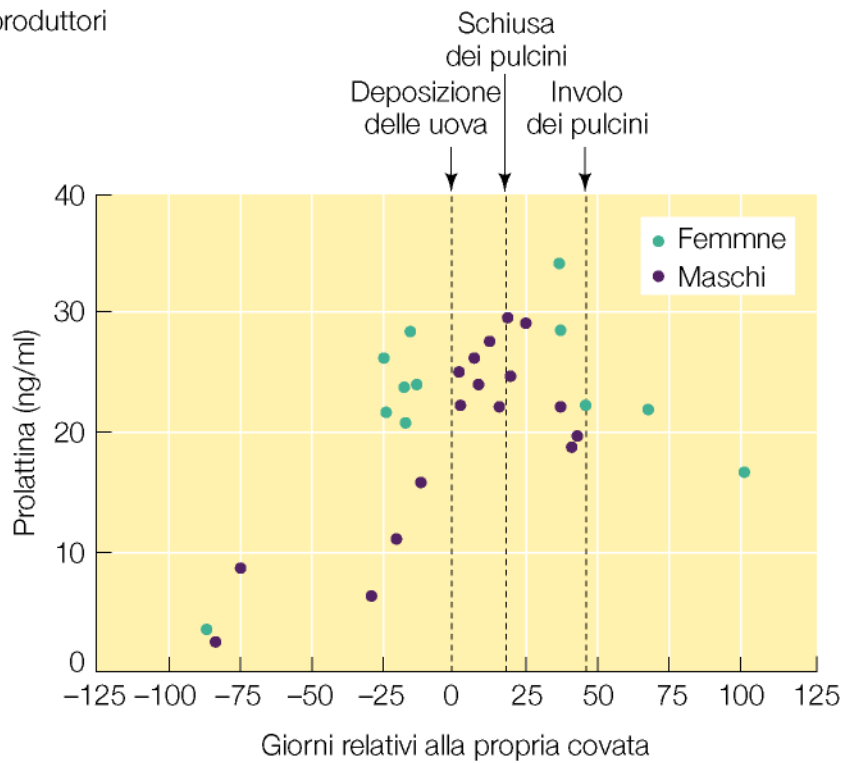
Behavioral tactic	First year			Second year				
	$y$	$r$	$f_1$	$o$	$r$	$s$	$m$	$f_2$
Primary helper	$1.8 \times 0.32 = 0.58$			$2.5 \times 0.50 \times 0.54 \times 0.60 = 0.41$				
Secondary helper	$1.3 \times 0.00 = 0.00$			$2.5 \times 0.50 \times 0.74 \times 0.91 = 0.84$				
Delayer	$0.0 \times 0.00 = 0.00$			$2.5 \times 0.50 \times 0.70 \times 0.33 = 0.29$				

Source: Reyer [1013]

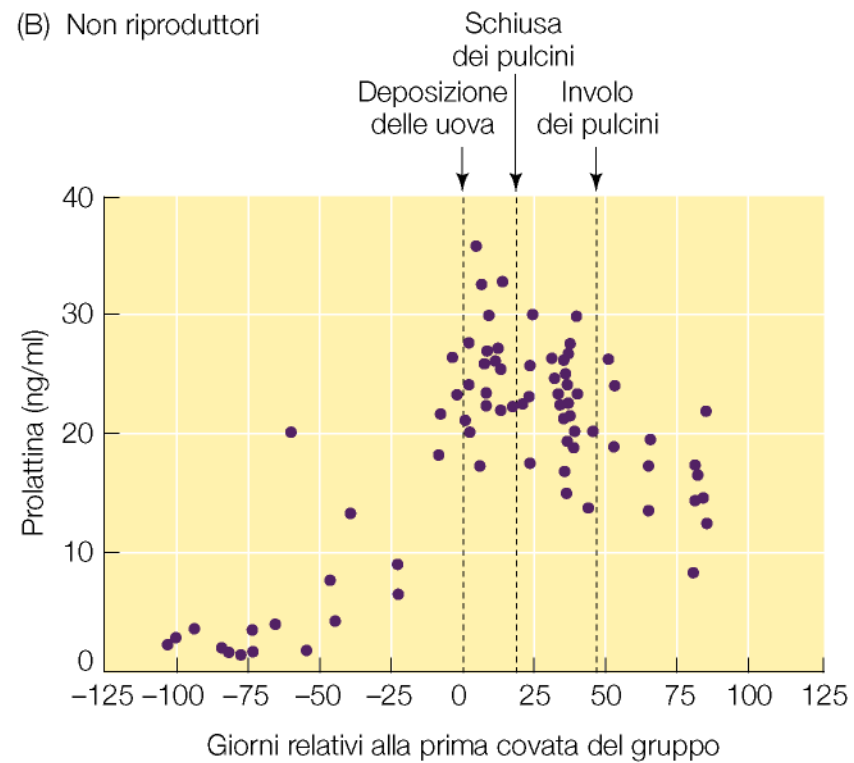
Symbols:  $y$  = extra young produced by helped parents;  $o$  = offspring produced by breeding ex-helpers and delayers;  $r$  = coefficient of relatedness between the male and  $y$ , and between the male and  $o$ ;  $f_1$  = fitness in first year (indirect fitness for the primary helper);  $f_2$  = direct fitness in second year;  $s$  = probability of surviving into the second year;  $m$  = probability of finding a mate in the second year.



(A) Riproduttori



(B) Non riproduttori

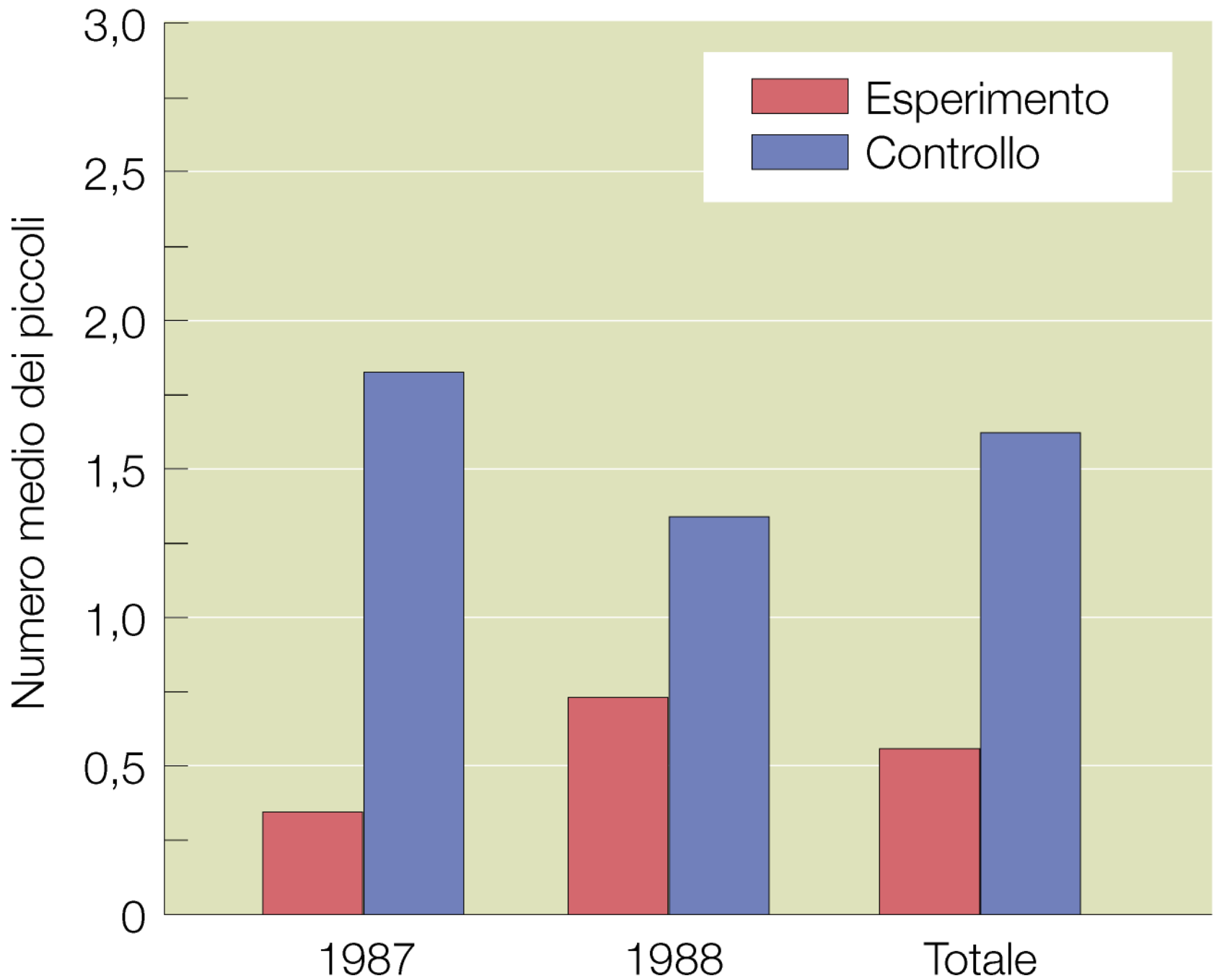


**TABLE 13.4** *Effect of Florida scrub jay helpers at the nest on the reproductive success of their parents and on their own inclusive fitness*

	Parents without breeding experience <sup>a</sup>	Parents with breeding experience
Average number of fledglings produced with no helpers	1.03	1.62
Average number of fledglings produced with helpers	2.06	2.20
Increased reproductive success due to help	1.03	0.58
Average number of helpers	1.70	1.90
Indirect fitness gained per helper	0.60	0.30

Source: Emlen [365]

<sup>a</sup>Includes pairs in which one parent has reproduced, which is why some pairs in this category acquire a helper at the nest.





Opzione di non partecipazione

Rinuncia alla stagione riproduttiva

Opzione di riproduzione

Si accoppia e nidifica

Opzione di parassitismo

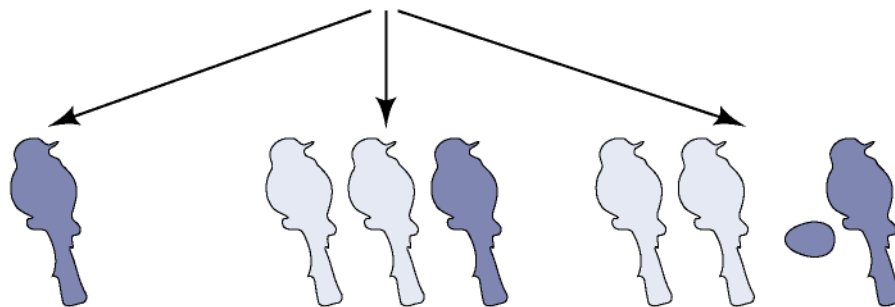
Depone le uova nel nido altrui



La femmina abbandona il nido natale



La femmina resta con i genitori



Rinuncia alla stagione riproduttiva

Opzione di non partecipazione

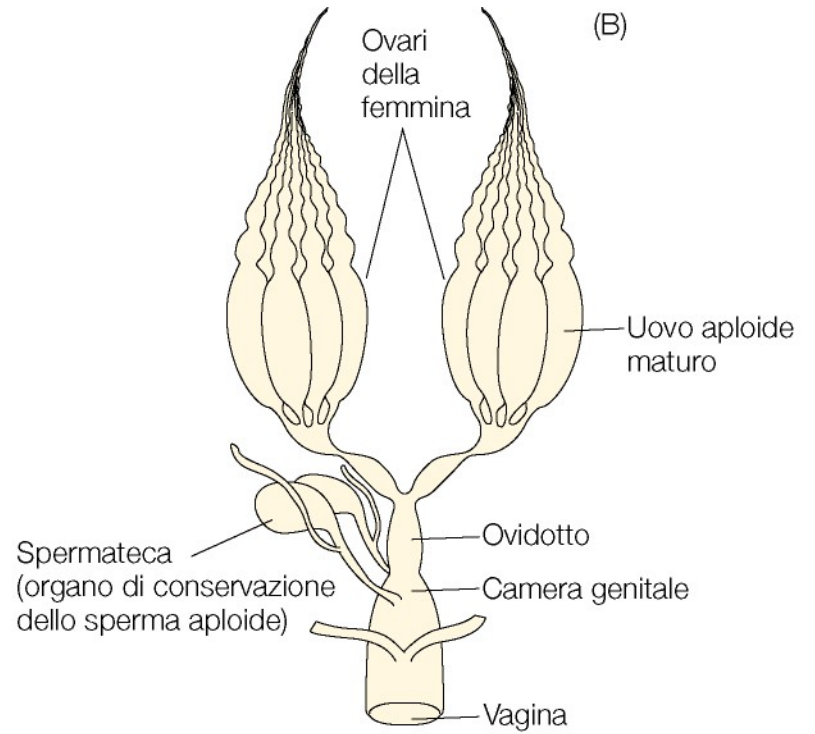
Aiuta ad allevare i propri fratelli

Opzione di aiutante al nido

Aiuta e depone le uova nel nido altrui

Opzione di aiuto e di parassitismo

(A)

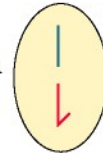


Uovo non fecondato

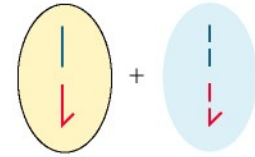


Figlio maschio aploide

Un solo cromosoma di ciascun tipo



Uovo + Spermatozoo

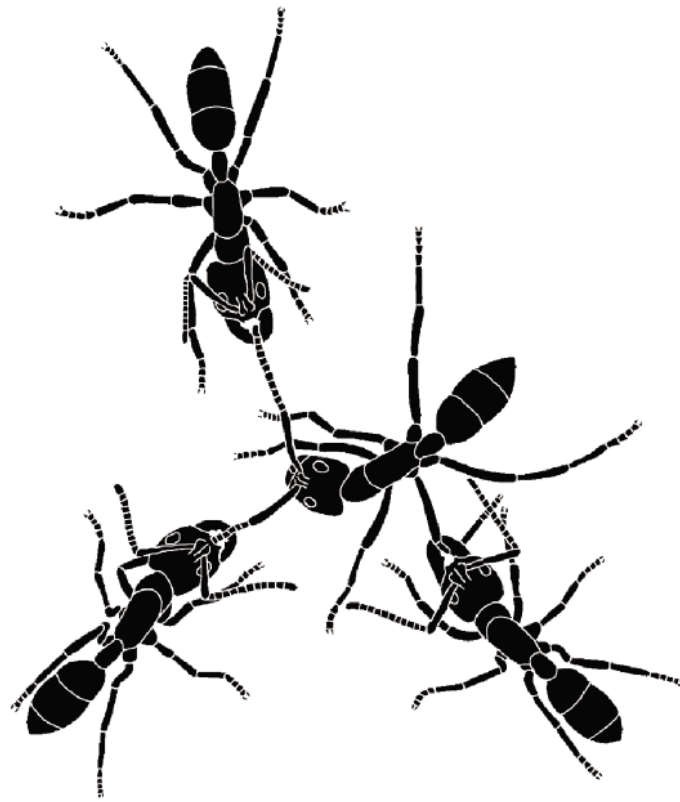


Figlia diploide

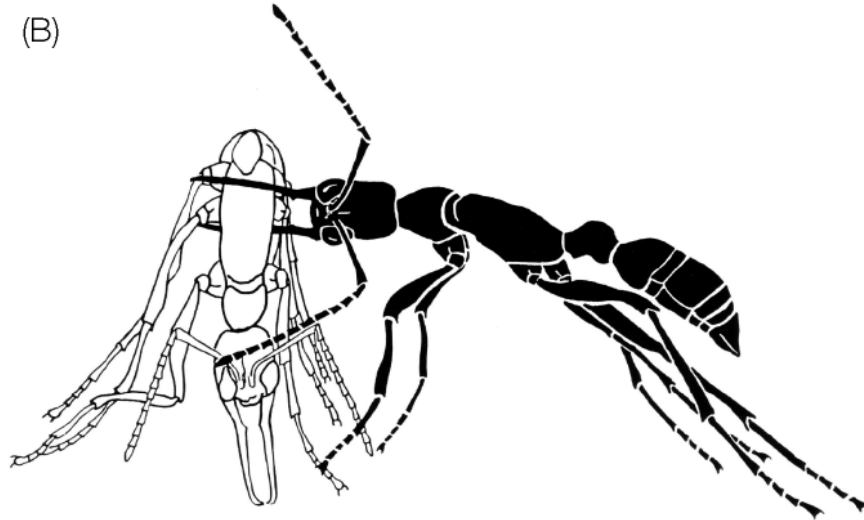
Due cromosomi di ciascun tipo



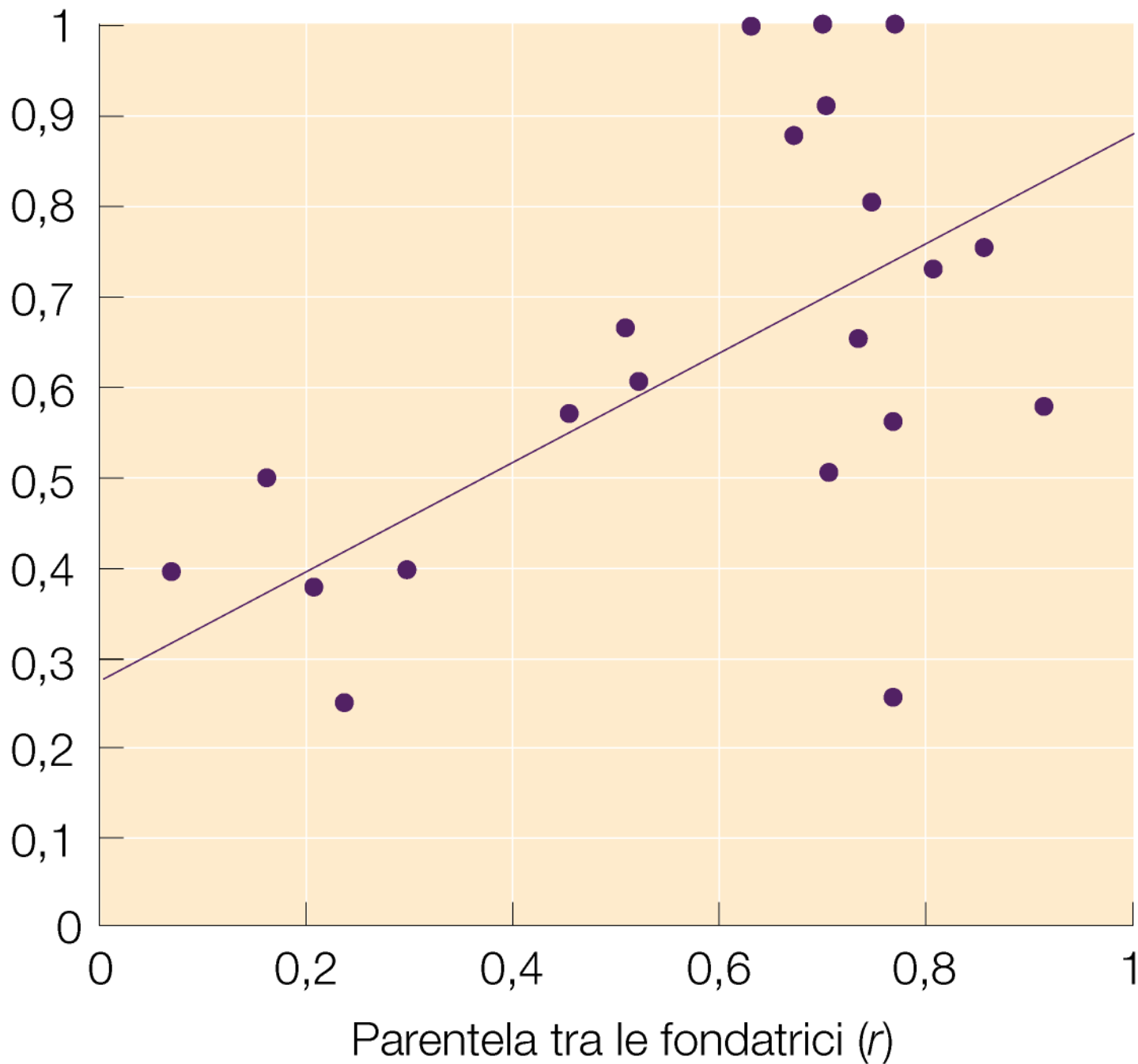
(A)



(B)

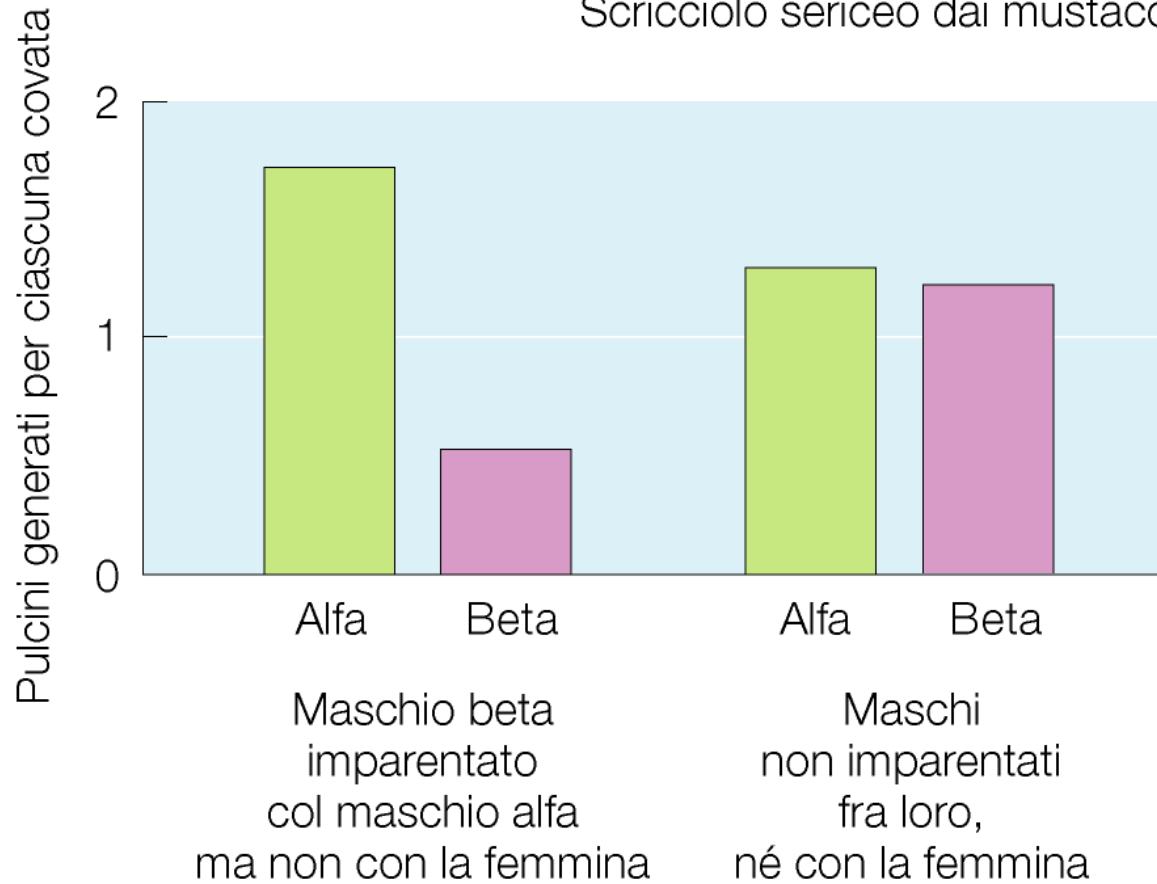


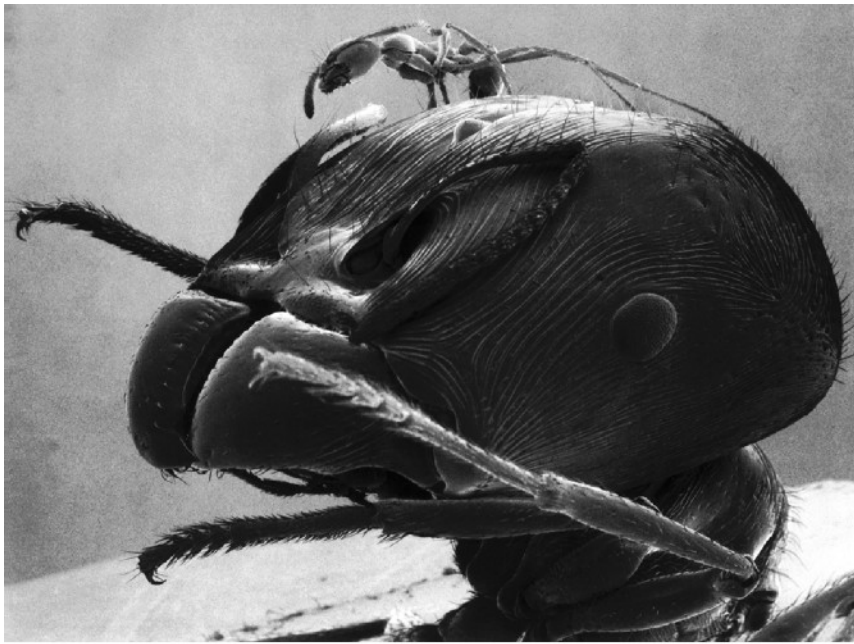
Proporzione dell'attività riproduttiva monopolizzata  
dalla femmina dominante



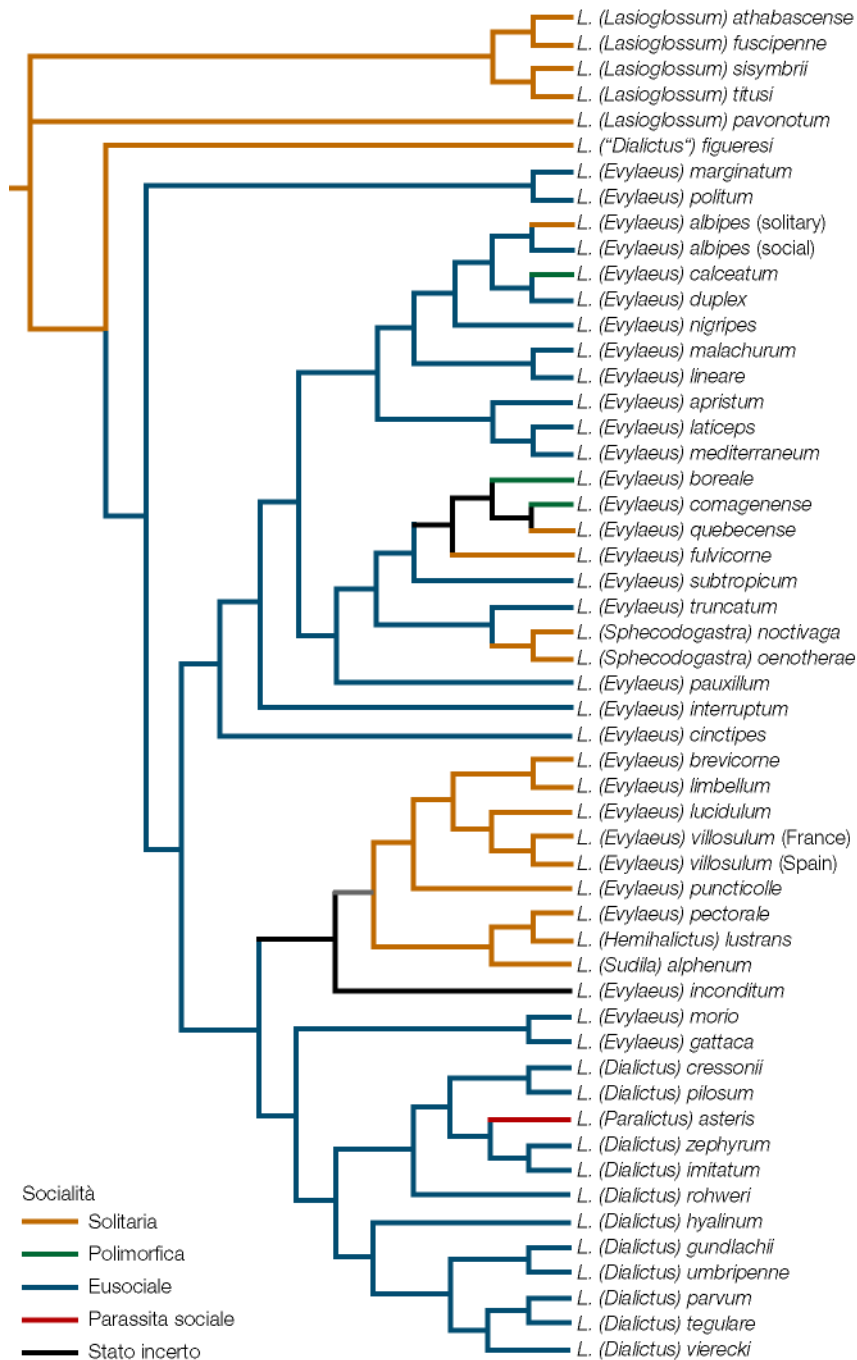


Scricciolo sericeo dai mustacchi





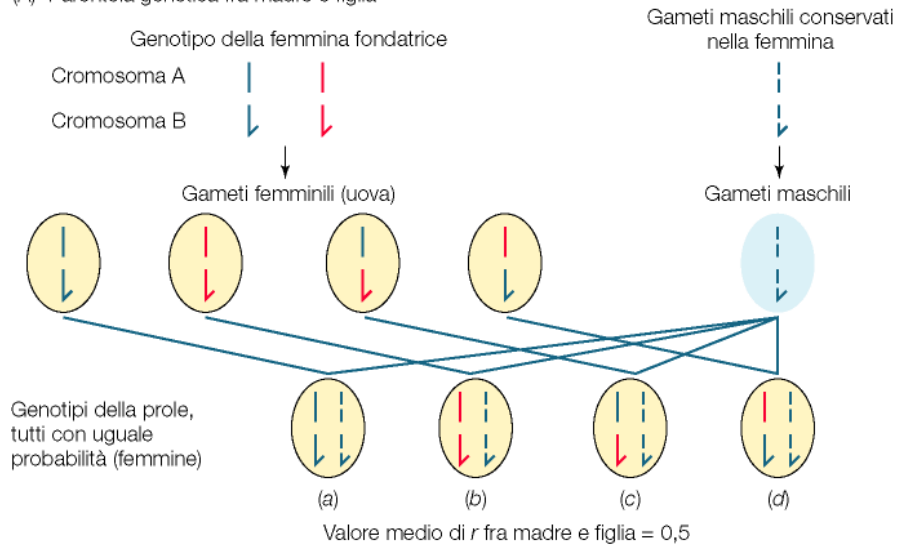




*Lasioglossum oenotherae*



(A) Parentela genetica fra madre e figlia



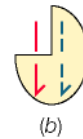
(B) Parentela genetica fra sorelle

Confronto fra un genotipo qualsiasi di una figlia e i possibili genotipi delle sue sorelle

Ad esempio



Somiglianza genetica  
75% (3 cromosomi su 4)



75%



100%



50%

Valore medio di  $r$  fra sorelle = 0,75

