Google links:

http://www.pnas.org/content/97/7/3309.full

http://user.demogr.mpg.de/jwv/pdf/Vaupel-PRSL-BS-268-2001-1466.pdf

http://magazine.jhsph.edu/2009/fall/news_briefs/fertility_and_the_fruit_fly/

http://www.theguardian.com/science/2011/feb/27/mormon-polygamists-fruit-fly

https://tspace.library.utoronto.ca/bitstream/1807/29563/1/Jagadeesh_Samyukta_201106_MSc_Thesis.pdf

http://www.bookrags.com/research/fruit-fly-drosophila-melanogaster-wob/

Pubmed links:

http://www.ncbi.nlm.nih.gov/pubmed/24274675

PLoS One. 2013 Aug 15;8(8):e72524. doi: 10.1371/journal.pone.0072524.

Control of male and female fertility by the netrin axon guidance genes.

Newquist G, Hogan J, Walker K, Lamanuzzi M, Bowser M, Kidd T.

The netrin axon guidance genes have previously been implicated in fertility in C. elegans and in vertebrates. Here we show that adult Drosophila lacking both netrin genes, NetA and NetB, have fertility defects in both sexes together with an inability to fly and reduced viability. NetAB females produce fertilized eggs at a much lower rate than wild type. Oocyte development and ovarian innervation are unaffected in NetAB females, and the reproductive tract appears normal. A small gene, hog, that resides in an intron of NetB does not contribute to the NetAB phenotype. Restoring endogenous NetB expression rescues egg-laying, but additional genetic manipulations, such as restoration of netrin midline expression and inhibition of cell death have no effect on fertility. NetAB males induce reduced egg-laying in wild type females and display mirror movements of their wings during courtship. Measurement of courtship parameters revealed no difference compared to wild type males. Transgenic manipulations failed to rescue male fertility and mirror movements. Additional genetic manipulations, such as removal of the enabled gene, a known suppressor of the NetAB embryonic CNS phenotype, did not improve the behavioral defects. The ability to fly was rescued by inhibition of neuronal cell death and pan-neural NetA expression. Based on our results we hypothesize that the adult fertility defects of NetAB mutants are due to ovulation defects in females and a failure to properly transfer sperm proteins in males, and are likely to involve multiple neural circuits.

Results: 80 hits : “fruit fly reproductive rate fecundity”

http://www.ncbi.nlm.nih.gov/pubmed/23483775

Physiol Entomol. 2013 Mar 1;38(1):81-88. Epub 2013 Feb 27.

Effects of diet and host access on fecundity and lifespan in two fruit fly species with different life history patterns.

Harwood JF, Chen K, Müller HG, Wang JL, Vargas RI, Carey JR.

The reproductive ability of female tephritids can be limited and prevented by denying access to host plants and restricting the dietary precursors of vitellogenesis. The mechanisms underlying the delayed egg production in each case are initiated by different physiological processes that are anticipated to have dissimilar effects on lifespan and reproductive ability later in life. The egg laying abilities of laboratory reared females of the Mediterranean fruit fly (*Ceratitis capitata* Wiedmann) and melon fly (*Bactrocera cucurbitae* Coquillett) from Hawaii are delayed or suppressed by limiting access to host fruits and dietary protein. In each case, this is expected to prevent the loss of lifespan associated with reproduction until protein or hosts are introduced. Two trends are observed in each species: Firstly, access to protein at eclosion leads to a greater probability of survival and higher reproductive ability than if it is delayed, and secondly, that delayed host access reduces lifetime reproductive ability without improving life expectancy. When host access and protein availability are delayed, the rate of reproductive senescence is reduced in the medfly, whereas the rate of reproductive senescence is generally increased in the melon fly. Overall, delaying reproduction lowers the fitness of females by constraining their fecundity for the remainder of the lifespan without extending the lifespan.

>>>>>>>>>>>>

http://www.ncbi.nlm.nih.gov/pubmed/23353929

Exp Gerontol. 2013 Mar;48(3):349-57. doi: 10.1016/j.exger.2013.01.008. Epub 2013 Jan 23.

Longevity for free? Increased reproduction with limited trade-offs in Drosophila melanogaster selected for increased life span.

Wit J, Sarup P, Lupsa N, Malte H, Frydenberg J, Loeschcke V.

Selection for increased life span in Drosophila melanogaster has been shown to correlate with decreased early fecundity and increased fecundity later in life. This phenomenon has been ascribed to the existence of trade-offs in which limited resources can be invested in either somatic maintenance or reproduction. In our longevity selection lines, we did not find such a trade-off. Rather, we find that females have similar or higher fecundity throughout life compared to non-selected controls. To determine whether increased longevity affects responses in other traits, we looked at several stress resistance traits (chill coma recovery, heat knockdown, desiccation and starvation), geotactic behaviour, egg-to-adult viability, body size, developmental time as well as metabolic rate. Longevity selected flies were more starvation resistant. However, in females longevity and fecundity were not negatively correlated with the other traits assayed. Males from longevity selected lines were slower at recovering from a chill induced coma and resting metabolic rate increased with age, but did not correlate with life span

>>>>>>>>>>>>>>>>>>>>

http://www.ncbi.nlm.nih.gov/pubmed/21931756

PLoS One. 2011;6(9):e24560. doi: 10.1371/journal.pone.0024560. Epub 2011 Sep 9.

Laboratory relationships between adult lifetime reproductive success and fitness surrogates in a Drosophila littoralis population.

Pekkala N, Kotiaho JS, Puurtinen M.

The difficulties in measuring total fitness of individuals necessitate the use of fitness surrogates in ecological and evolutionary studies. These surrogates can be different components of fitness (e.g. survival or fecundity), or proxies more uncertainly related to fitness (e.g. body size or growth rate). Ideally, fitness would be measured over the lifetime of individuals; however, more convenient short-time measures are often used. Adult lifetime reproductive success (adult LRS) is closely related to the total fitness of individuals, but it is difficult to measure and rarely included in fitness estimation in experimental studies. We explored phenotypic correlations between female adult LRS and various commonly used fitness components and proxies in a recently founded laboratory population of Drosophila littoralis. Noting that survival is usually higher in laboratory conditions than in nature, we also calculated adjusted adult LRS measures that give more weight to early reproduction. The lifetime measures of fecundity, longevity, and offspring viability were all relatively highly correlated with adult LRS. However, correlations with short-time measures of fecundity and offspring production varied greatly depending on the time of measurement, and the optimal time for measurement was different for unadjusted compared to adjusted adult LRS measures. Correlations between size measures and adult LRS varied from weak to modest, leg size and female weight having the highest correlations. Our results stress the importance of well-founded choice of fitness surrogates in empirical research

>>>>>>>>>>>>>>>>>>>>>>

http://www.ncbi.nlm.nih.gov/pubmed/19939842

Proc Biol Sci. 2010 Mar 22;277(1683):963-9. doi: 10.1098/rspb.2009.1807. Epub 2009 Nov 25.

Repeated stress exposure results in a survival-reproduction trade-off in Drosophila melanogaster.

Marshall KE, Sinclair BJ.

While insect cold tolerance has been well studied, the vast majority of work has focused on the effects of a single cold exposure. However, many abiotic environmental stresses, including temperature, fluctuate within an organism's lifespan. Given that organisms may trade-off survival at the cost of future reproduction, we investigated the effects of multiple cold exposures on survival and fertility in the model organism Drosophila melanogaster. We found that multiple cold exposures significantly decreased mortality compared with the same length of exposure in a single sustained bout, but significantly decreased fecundity (as measured by r, the intrinsic rate of increase) as well, owing to a shift in sex ratio. This change was reflected in a long-term decrease in glycogen stores in multiply exposed flies, while a brief effect on triglyceride stores was observed, suggesting flies are reallocating energy stores. Given that many environments are not static, this trade-off indicates that investigating the effects of repeated stress exposure is important for understanding and predicting physiological responses in the wild.

>>>>>>>>>>>>>>>

http://www.ncbi.nlm.nih.gov/pubmed/18479342

J Anim Ecol. 2008 Jul;77(4):670-7. doi: 10.1111/j.1365-2656.2008.01401.x. Epub 2008 May 9.

Laboratory evolution of population stability in Drosophila: constancy and persistence do not necessarily coevolve.

Dey S, Prasad NG, Shakarad M, Joshi A.

1. Despite considerable theoretical work, the evolution of population stability has rarely been investigated empirically. Moreover, it is not clear whether different stability properties of a population evolve together, or independently. 2. We investigate the evolution of two aspects of population stability using laboratory

populations of Drosophila melanogaster selected for faster preadult development and early reproduction, and their matched controls. 3. We show that the constancy stability of the selected populations is significantly higher than their controls, confirming a previous observation that population stability can evolve as a by-product of life-history evolution. This enhanced constancy stability is due to a reduced maximal per capita growth rate, brought about by a reduction in fecundity of the selected populations as a result of the trade-off between developmental rate and fecundity. 4. Persistence stability, as reflected by the probability of extinction, does not differ significantly between selected and control populations. 5. We also show how seemingly trivial experimental details, such as the protocol for restarting extinct populations, can interact with life-history traits to alter the manifestation of the stability properties of a population.

>>>>>>>>>>>>>>>>>>>>

http://www.ncbi.nlm.nih.gov/pubmed/18268352

Proc Natl Acad Sci U S A. 2008 Feb 19;105(7):2498-503. doi: 10.1073/pnas.0710787105. Epub 2008 Feb 11.

Lifespan and reproduction in Drosophila: New insights from nutritional geometry.

Lee KP, Simpson SJ, Clissold FJ, Brooks R, Ballard JW, Taylor PW, Soran N, Raubenheimer D.

Modest dietary restriction (DR) prolongs life in a wide range of organisms, spanning single-celled yeast to mammals. Here, we report the use of recent techniques in nutrition research to quantify the detailed relationship between diet, nutrient intake, lifespan, and reproduction in Drosophila melanogaster. Caloric restriction (CR) was not responsible for extending lifespan in our experimental flies. Response surfaces for lifespan and fecundity were maximized at different protein-carbohydrate intakes, with longevity highest at a protein-to-carbohydrate ratio of 1:16 and egg-laying rate maximized at 1:2. Lifetime egg production, the measure closest to fitness, was maximized at an intermediate P:C ratio of 1:4. Flies offered a choice of complementary foods regulated intake to maximize lifetime egg production. The results indicate a role for both direct costs of reproduction and other deleterious consequences of ingesting high levels of protein. We unite a body of apparently conflicting work within a common framework and provide a platform for studying aging in all organisms

>>>>>>>>>>>>>>>>>>>>>>>>

http://www.ncbi.nlm.nih.gov/pubmed/18171147

Am Nat. 2008 Jan;171(1):10-21. doi: 10.1086/523944.

Mating frequency and inclusive fitness in Drosophila melanogaster.

Priest NK, Galloway LF, Roach DA.

In many species, increased mating frequency reduces maternal survival and reproduction. In order to understand the evolution of mating frequency, we need to determine the consequences of increased mating frequency for offspring. We conducted an experiment in Drosophila melanogaster in which we manipulated the mating frequency of mothers and examined the survival and fecundity of the mothers and their daughters. We found that mothers with the highest mating frequency had accelerated mortality and more rapid reproductive senescence. On average, they had 50% shorter lives and 30% lower lifetime reproductive success (LRS) than did mothers with the lowest mating frequency. However, mothers with the highest mating frequency produced daughters with 28% greater LRS. This finding implies that frequent mating stimulates cross-generational fitness trade-offs such that maternal fitness is reduced

while offspring fitness is enhanced. We evaluate these results using a demographic metric of inclusive fitness. We show that the costs and benefits of mating frequency depend on the growth rate of the population. In an inclusive fitness context, there was no evidence that increased mating frequency results in fitness costs for mothers. These results indicate that cross-generational fitness trade-offs have an important role in sexual selection and life-history evolution.

>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

http://www.ncbi.nlm.nih.gov/pubmed/16677788

Exp Gerontol. 2006 Jun;41(6):566-73. Epub 2006 May 4.

Temperature-dependent trade-offs between longevity and fertility in the Drosophila mutant, methuselah.

Mockett RJ, Sohal RS.

Single gene, hypomorphic mutations which extend the life spans of cold-blooded animals, such as the methuselah (mth) mutation in the fruit fly, Drosophila melanogaster, may have additional, deleterious effects on overall fitness. The hypotheses tested here were: (i) that the extension of life span by mth might be temperature-dependent, and (ii) that it might be associated with depression of reproductive output, physical activity, or the rate of metabolism. The effect of mth on life span was smaller in magnitude than reported previously, and it was both sex-specific and temperature-dependent. Female longevity was increased only at 29 degrees C, whereas for male flies the extension of mean life span diminished progressively from 15-25% 25-29 degrees C to 2% at 18 degrees C, and the survival time at 4 degrees C was decreased by 22-39%. Conversely, the lifetime reproductive output of mth mutants was decreased at 29 degrees C, but increased at 18-22 degrees C. The walking speed of mth flies was significantly elevated, but mth had no effect on the rate of oxygen consumption at 25 degrees C. Collectively, the results demonstrate that where the life span is extended, there is an offsetting effect on reproductive output, suggesting that mth induces trade-off effects and is not a direct, mechanistic regulator of the aging process.

>>>>>>>>>>>>>>>>>>>>>>>>>>>

http://www.ncbi.nlm.nih.gov/pubmed/16300483

Aging Cell. 2005 Dec;4(6):309-17.

Behavioral, physical, and demographic changes in Drosophila populations through dietary restriction.

Bross TG, Rogina B, Helfand SL.

Dietary restriction (DR) is a valuable experimental tool for studying the aging process. Primary advancement of research in this area has relied on rodent models, but attention has recently turned toward Drosophila melanogaster. However, little is known about the baseline effects of DR on wild-type Drosophila and continued experimentation requires such information. The findings described here survey the effects of DR on inbred, wild-type populations of Canton-S fruit flies and demonstrate a robust effect of diet on longevity. Over a circumscribed range of dietary conditions, healthy lifespan varies by as much as 121% for wild-type Drosophila females. Significant differences are also observed for male flies, but the magnitude of the DR effect is less robust. Mortality analyses of the survivorship data reveal that this variation in lifespan can be attributed to a modulation of the rate parameter for the mortality function - a change in the demographic rate of aging. Since the feeding of fruit flies is less easily controlled than that of rodents, this research also addresses the validity of applying a DR model to Drosophila populations.

Feeding and body weight data for flies given the various dietary conditions surveyed indicate that Drosophila on higher-calorie diets consume a similar volume of food to those on a low-calorie diet, resulting in different levels of calorie intake. Fertility and activity levels demonstrate that the diets surveyed are comparable, and that increasing the calorie content of laboratory food up to twice the normal concentration is not pathologic for experimental fly populations

>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

http://www.ncbi.nlm.nih.gov/pubmed/15935441

Dietary restriction in Drosophila.

Partridge L, Piper MD, Mair W.

The fruit fly Drosophila is a useful organism for the investigation of the mechanisms by which dietary restriction (DR) extends lifespan. Its relatively short generation time, well-characterised molecular biology, genetics and physiology and ease of handling for demographic analysis are all major strengths. Lifespan has been extended by DR applied to adult Drosophila, by restriction of the availability of live yeast or by co-ordinate dilution of the whole food medium. Lifespan increases to a maximum through DR with a progressive dilution of the food and then decreases through starvation as the food is diluted further. Daily and lifetime fecundities of females are reduced by food dilution throughout the DR and starvation range. Standard Drosophila food ingredients differ greatly between laboratories and fly stocks can differ in their responses to food dilution, and a full range of food concentrations should therefore be investigated when examining the response to DR. Flies do not alter the time that they spend feeding in response to DR. Both mean and maximum lifespan are extended by DR. The nutrients critical for the response to DR in Drosophila require definition. The extension of lifespan in response to DR is very much greater in females than in males. Two nutrient-sensing pathways, the insulin/IGF-like and TOR pathways, have been implicated in mediating this response of lifespan to DR in Drosophila, as have two protein deacetylases, dSir2 and Rpd3, although the precise nature of this interaction remain to be characterised. Although female fecundity is reduced by DR, the response of lifespan to DR appears normal in sterile females, possibly implying that reduced fecundity is not necessary for extension of lifespan by DR. There is no reduction in metabolic rate or in the rate of generation of superoxide and hydrogen peroxide from isolated mitochondria in response to DR. DR acts acutely and rapidly (within 48 h) to reduce the mortality of flies that are fully fed to the level found in animals exposed to DR throughout life. This rapid mortality rate recovery provides a powerful framework within which to further investigate the mechanisms by which DR extends lifespan.

>>>>>>>>>>>>>>>>>>>>

http://www.ncbi.nlm.nih.gov/pubmed/15247090

Ann N Y Acad Sci. 2004 Jun;1019:577-80.

How an individual fecundity pattern looks in Drosophila and medflies.

Novoseltsev VN, Arking R, Carey JR, Novoseltseva JA, Yashin AI.

Reproduction usually is characterized by a mean-population fecundity pattern. Such a pattern has a maximum at earlier ages and a subsequent gradual decline in egg production. It is shown that individual fecundity trajectories do not follow such a pattern. In particular, the regular individual fecundity pattern has no maximum so that experimentally observed maximums are average-related artifacts. The three-stage description of individual fecundity, which includes maturation, maturity, and reproductive senescence, is more appropriate. Data are presented for Drosophila and Mediterranean fruitfly females that clearly confirm this hypothesis. A systematic error between egg-laying scores and the regular individual pattern allows for evaluation of how close the random scores are to the pattern. The first finding

of the analysis of the systematic errors is that they are consistent with the three-stage hypothesis and do not contradict the absence of the maximum in the regular individual pattern. The other finding is the existence of obvious dynamic properties of the systematic error. The slow decrease in egg-laying at the maturity stage might be the result of a cost of mating. It can also be a consequence of "structural" senescence, that is, a slow rate accumulation of oxidative damage in the gonads.

>>

Evolution. 2002 Jun;56(6):1136-49.

Evolutionary optimality applied to Drosophila experiments: hypothesis of constrained reproductive efficiency.

Novoseltsev VN, Arking R, Novoseltseva JA, Yashin AI.

The general purpose of the paper is to test evolutionary optimality theories with experimental data on reproduction, energy consumption, and longevity in a particular Drosophila genotype. We describe the resource allocation in Drosophila females in terms of the oxygen consumption rates devoted to reproduction and to maintenance. The maximum ratio of the component spent on reproduction to the total rate of oxygen consumption, which can be realized by the female reproductive machinery, is called metabolic reproductive efficiency (MRE). We regard MRE as an evolutionary constraint. We demonstrate that MRE may be evaluated for a particular Drosophila phenotype given the fecundity pattern, the age-related pattern of oxygen consumption rate, and the longevity. We use a homeostatic model of aging to simulate a life history of a representative female fly, which describes the control strain in the long-term experiments with the Wayne State Drosophila genotype. We evaluate the theoretically optimal trade-offs in this genotype. Then we apply the Van Noordwijk-de Jong resource acquisition and allocation model, Kirkwood's disposable soma theory. and the Partridge-Barton optimality approach to test if the experimentally observed trade-offs may be regarded as close to the theoretically optimal ones. We demonstrate that the two approaches by Partridge-Barton and Kirkwood allow a positive answer to the question, whereas the Van Noordwijk-de Jong approach may be used to illustrate the optimality. We discuss the prospects of applying the proposed technique to various Drosophila experiments, in particular those including manipulations affecting fecundity.

>>>>>>>>>>>>>>>>>>>>>>>

http://www.ncbi.nlm.nih.gov/pubmed/11681737

Evolution. 2001 Sep;55(9):1822-31.

Decline in offspring viability as a manifestation of aging in Drosophila melianogaster.

Kern S, Ackermann M, Stearns SC, Kawecki TJ.

The evolutionary explanation of senescence proposes that selection against alleles with deleterious effects manifested only late in life is weak because most individuals die earlier for extrinsic reasons. This argument also applies to alleles whose deleterious effects are nongenetically transmitted from mother to progeny, that is, that affect the performance of progeny produced at late ages rather than of the aging individuals themselves. We studied the effect of maternal age on offspring viability (egg hatching success and larva-to-adult survival) in two sets of Drosophila melanogaster lines (HAM/LAM and YOUNG/OLD), originating from two long-term selection experiments. In each set, some lines (HAM and YOUNG, respectively) have been selected for early reproduction, whereas later reproduction was favored in their counterparts (LAM and OLD). In the HAM and LAM lines, both egg hatching success and larval viability declined with mother's age and did so with accelerating rates. The hatching success declined significantly

faster with maternal age in HAM than in LAM lines, according to one of two statistical approaches used. Egg hatching success also declined with maternal age in YOUNG and OLD lines, with no difference between the selection regimes. However, the relationship between mother's age and offspring larva-to-adult viability differed significantly between these two selection regimes: a decline of larval viability with maternal age occurred in YOUNG lines but not in OLD lines. This suggests that the rate with which offspring viability declines with mother's age responded to selection for early versus late reproduction. We suggest broadening the evolutionary concept of senescence to include intrinsically caused declines in offspring quality with maternal age.

>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

http://www.ncbi.nlm.nih.gov/pubmed/11005293

Evolution. 2000 Aug;54(4):1260-72.

Life-history correlates of evolution under high and low adult mortality.

Gasser M, Kaiser M, Berrigan D, Stearns SC.

Life-history theory predicts evolutionary changes in reproductive traits and intrinsic mortality rates in response to differences in extrinsic mortality rates. Trade-offs between life- history traits play a pivotal role in these predictions, and such trade-offs are mediated, at least in part, by physiological allocations. To gain insight into these trade-offs, we have been performing a long-term experiment in which we allow fruitflies, Drosophila melanogaster, to evolve in response to high (HAM) and low (LAM) adult mortality rates. Here we analyze the physiological correlates of the life-history trade-offs. In addition to changing development time and early fecundity in the direction predicted, high adult mortality affected three traits expressed early in life-body size, growth rate, and ovariole number-but had little or no effect on body composition (relative fat content), viability, metabolic rate, activity, starvation resistance, or desiccation resistance. Correlations among lines revealed trade-offs between early fecundity, late fecundity, and starvation resistance, which appear to be mediated by differential allocation of lipids.

>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

C R Acad Sci Hebd Seances Acad Sci D. 1972 Sep 18;275(12):1251-4.

[Longevity and rate of reproduction of Drosophila subjected to a high temperature].

[Article in French]

Laugé G.

POPULATION

Theor Popul Biol. 1988 Oct;34(2):93-117.

Models of growth with density regulation in more than one life stage.

Rodriguez DJ.

Author information

- Department of Genetics, University of California, Davis 95616.

Abstract

Discrete-time models of growth of populations with nonoverlapping generations and density regulation in two life stages are studied. It is assumed that there is no delay in the effects of density. Assigning exponential, linear, or hyperbolic functions to describe the dependence of preadult survival and fecundity on density, nine models are obtained. The dynamics of the model resulting from using the exponential function to describe the density dependence of both preadult survival and fecundity is analyzed: for large values of the intrinsic rate of increase there may exist up to three equilibrium population sizes, two stable. This indicates that a life history with two episodes of density regulation can give origin to alternative stable states. The models are fitted to recruitment data from growth experiments of Drosophila laboratory populations obtained with the Serial Transfer System Type 2 (Ayala et al., 1973. Theor. Pop. Biol. 4, 331-356) and collected by other authors. The results of the fittings suggest that this recruitment data can be adequately described with the models.

>>>>>>>>>>>>>>>>>>>>

Genetic **population** replacement for insect control: a new method for estimating fitness and generation time of continuously-breeding competing strains.

Barclay HJ, Fitz-Earle M.

Theor Appl Genet. 1983 Sep;66(3-4):225-32. doi: 10.1007/BF00251150.

Abstract

A model of complete underdominance that applies to population replacement for insect control by compound autosomes or compound; free arm strains, has been used to develop a new technique for estimating fitness and generation time in continuously-breeding competing populations, without resorting to measurement of birth rate, survivorship etc. The method is statistical and uses successive intervals of various sizes in an estimation equation. Estimates of fitness and generation time are revealed as a result of convergence of data from competitions in which a strain either becomes fixed or is eliminated in a mixed population. The technique has been applied to data from Drosophila melanogaster cage competitions with believable results. Difficulties resulting from the frequency dependence of the estimates over time and the inherent cyclicity of the population competition data are evaluated. Fitness estimates from this method of successive intervals are lower than those from another unstable equilibrium method. The former technique measures fitness in population at carrying capacity in which density-dependence is prominent, whereas the latter method is applicable only to populations in which density-dependence is negligible. The implications to insect control of an estimation procedure which yields fitness values for continuously-breeding populations under conditions of density dependence are discussed

>>>>>>>>>>>>>>>>>>>>>>>

Arch Gerontol Geriatr. 1982 May;1(1):3-27.

Rate of aging, rate of dying and the mechanism of mortality.

Economos AC.

Abstract

The history of the search for the law and the mechanism of mortality is reviewed. Recent evidence is summarized showing that the Gompertz law of exponentially increasing force of mortality is only an

approximate model of mortality kinetics; various other models also provide a more or less satisfactory fit of mortality kinetics data. In particular, a simple model proposed by the author contains the Gompertz model as a special case and is of general validity: it consists of exponentially increasing cumulative mortality in an initial age range followed by exponentially decreasing survivorship. The various proposed mechanisms underlying mortality kinetics are reviewed, with emphasis on their origin and similarities, and a mechanism is proposed mending two basic classical ideas which are only partially valid: (1) Gompertz's accelerated decline of vitality coupled with identical aging rates of the individuals of a population; and (2) Simms' idea of statistically distributed individual aging rates with a uniform average aging rate (linear decline of physiological vitality). This theory provides a basis for analyzing the relationship between rates of aging and rates of dying.

>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

J Evol Biol. 2013 Feb;26(2):375-85. doi: 10.1111/jeb.12054. Epub 2012 Nov 30.

On the genetic parameter determining the efficiency of purging: an estimate for Drosophila egg-to-pupae viability.

Bersabé D, García-Dorado A.

Author information

- Departamento de Genética, Facultad de Biología, Universidad Complutense, Madrid, Spain.

Abstract

The consequences of inbreeding on fitness can be crucial in evolutionary and conservation grounds and depend upon the efficiency of purging against deleterious recessive alleles. Recently, analytical expressions have been derived to predict the evolution of mean fitness, taking into account both inbreeding and purging, which depend on an 'effective purging coefficient (d(e))'. Here, we explore the validity of that predictive approach and assay the strength of purging by estimating d(e) for egg-to-pupae viability (EPV) after a drastic reduction in population size in a recently captured base population of Drosophila melanogaster. For this purpose, we first obtained estimates of the inbreeding depression rate (δ) for EPV in the base population, and we found that about 40% was due to segregating recessive lethals. Then, two sets of lines were founded from this base population and were maintained with different effective size throughout the rest of the experiment (N = 6; N = 12), their mean EPV being assayed at different generations. Due to purging, the reductions in mean EPV experienced by these lines were considerably smaller than the corresponding neutral predictions. For the 60% of δ attributable to nonlethal deleterious alleles, our results suggest an effective purging coefficient d(e) > 0.02. Similarly, we obtain that d(e) > 0.09 is required to roughly account for purging against the pooled inbreeding depression from lethal and nonlethal deleterious alleles. This implies that purging should be efficient for population sizes of the order of a few tens and larger, but might be inefficient against nonlethal deleterious alleles in smaller populations.

>>

Genetics. 2012 Oct;192(2):533-98. doi: 10.1534/genetics.112.142018. Epub 2012 Jun 5.

Genomic variation in natural populations of Drosophila melanogaster.

Langley CH, Stevens K, Cardeno C, Lee YC, Schrider DR, Pool JE, Langley SA, Suarez C, Corbett-Detig RB, Kolaczkowski B, Fang S, Nista PM, Holloway AK, Kern AD, Dewey CN, Song YS, Hahn MW, Begun DJ.

Author information

- Department of Evolution and Ecology, University of California, Davis, CA 95616, USA. chlangley@ucdavis.edu

Abstract

This report of independent genome sequences of two natural populations of Drosophila melanogaster (37 from North America and 6 from Africa) provides unique insight into forces shaping genomic polymorphism and divergence. Evidence of interactions between natural selection and genetic linkage is abundant not only in centromere- and telomere-proximal regions, but also throughout the euchromatic arms. Linkage disequilibrium, which decays within 1 kbp, exhibits a strong bias toward coupling of the more frequent alleles and provides a high-resolution map of recombination rate. The juxtaposition of population genetics statistics in small genomic windows with gene structures and chromatin states yields a rich, high-resolution annotation, including the following: (1) 5'- and 3'-UTRs are enriched for regions of reduced polymorphism relative to lineage-specific divergence; (2) exons overlap with windows of excess relative polymorphism; (3) epigenetic marks associated with active transcription initiation sites overlap with regions of reduced relative polymorphism and relatively reduced estimates of the rate of recombination; (4) the rate of adaptive nonsynonymous fixation increases with the rate of crossing over per base pair; and (5) both duplications and deletions are enriched near origins of replication and their density correlates negatively with the rate of crossing over. Available demographic models of X and autosome descent cannot account for the increased divergence on the X and loss of diversity associated with the out-of-Africa migration. Comparison of the variation among these genomes to variation among genomes from D. simulans suggests that many targets of directional selection are shared between these species.

>>>

temporal estimates. Nevertheless, population genetic variation is not being depleted, presumably because of past or ongoing migration. A clearer picture of current and short-term effective population sizes will only follow with better knowledge of migration rates between populations. Different methods are not necessarily estimating the same N(e) , they are subject to different bias, and the biology, demography and history of the population(s) may affect different estimators differently.