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Sex ratio variation and sex determination in *Urtica dioica*

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References

- Agrawal RL (1998) Fundamentals of Plant Breeding and Hybrid Seed Production. Science Publishers, Inc. USA.
- Ainsworth C, Parker J, Buchanan-Wollaston V (1998) Sex determination in plants. Current Topics in Developmental Biology 3: 167-223.
- Al Mufti MM, Sydes CL, Furness SB, Grime JP, Band SR (1977) A quantitative analysis of shoot phenology and dominance in herbaceous vegetation. Journal of Ecology 65: 759-791.
- Allen GA, Antos JA (1993) Sex ratio variation in the dioecious shrub *Oemleria cerasiformis*. American Naturalist 141: 537-553.
- Alström-Rapaport C, Lascoux M, Gullberg U (1997) Sex determination and sex ratio in the dioecious shrub *Salix viminalis*. Theoretical and Applied Genetics 94: 493-497.
- Baker HG (1959) Reproductive methods as factors in speciation in flowering plants. Cold Spring Harbor Symposium of Quantitative Biology 24: 177-191.
- Barrett SCH (2003) Mating strategies in flowering plants: the outcrossing-selfing paradigm and beyond. Philosophical Transactions of the Royal Society of London B 358: 991-1004.
- Barrett SCH, Case AL, Peters GB (1999) Gender modification and resource allocation in the subdioecious *Wurmbea dioica* (Colchicaceae). Journal of Ecology 87: 123-137.
- Bawa KS (1980) Evolution of dioecy in flowering plants. Annual Review of Ecology and Systematics 11: 15-39.
- Bierzychudek P, Eckart V (1988) Spatial segregation of the sexes of dioecious plants. American Naturalist 132: 34-43.
- Boavida LC, Vieira AM, Becker JD, Feijo JA (2005) Gametophyte-interaction and sexual reproduction: how plants make a zygote. International Journal of Developmental Biology 49: 615-632.
- Bracale I, Caporali E, Galli MG, Longo C, Marziani-Longo G, Rossi G, Spada A, Soave E, Falavigna A, Raffaldi F, Maestri E, Restiva F M, Tassi F (1991) Sex determination and differentiation in *Asparagus officinalis* L. Plant Science 80: 67-77.
- Bull JJ (1983) The Evolution of Sex Determining Mechanisms. Benjamin/Cummings, Menlo Park, California, USA.

REFERENCES

- Bull JJ, Vogt RC, Bulmer MG (1982) Heritability of sex ratio in turtles with environmental sex determination. *Evolution* 36: 333-341.
- Bull JJ, Charnov EL (1988) How fundamental are Fisherian sex ratios? *Oxford Surveys in Evolutionary Biology* 5: 96-135.
- Bulmer MG, Taylor PD (1980) Dispersal and the sex ratio. *Nature* 284: 448-449.
- Carlquist S (1974) *Island Biology*. Columbia University Press, New York, USA.
- Carroll SB, Mulcahy DL (1993) Progeny sex ratios in dioecious *Silene latifolia*. *American Journal of Botany* 80: 551-556.
- Chailakhyan MK, Khrianin VN (1987) Sexuality in plants and its hormonal regulation. Springer-Verlag, New York, USA.
- Charlesworth D (2002) Plant sex determination and sex chromosomes. *Heredity* 88: 94-101.
- Charlesworth D, Guttman DS (1999) The evolution of dioecy and plant sex chromosome systems. In: Ainsworth CC (ed.) *Sex Determination in Plants*, BIOSIS Scientific Publishers Ltd, Oxford, pp 25-49.
- Charnov EL (1975) Sex ratio selection in an age structured population. *Evolution* 29: 336-367.
- Charnov EL (1982) *The Theory of Sex Allocation*. Princeton University Press, Princeton.
- Chattopadhyay D, Sharma AK (1991) Sex determination in dioecious species of plants. *Feddes Repertorium* 102: 29-55.
- Clutton-Brock TH, Albon SD, Guinness FE (1984) Maternal dominance, breeding success, and birth sex ratios in red deer. *Nature* 308: 358-60.
- Conn JS, Blum U (1981) Sex ratio of *Rumex hastatus*: the effect of environmental factors and certation. *Evolution* 35: 1108-1116.
- Correns C (1928) Bestimmung, Vererbung und Verteilung des Geschlechts bei den höheren Pflanzen. In: Baur E, Hartmann M (eds.) *Handbuch der Vererbungswissenschaft*, Verlag von Gebrüder Bornträger, Berlin, Volume 2.
- Corriveau JL, Coleman AW (1989) Rapid screening method to detect potential bi-parental inheritance of plastid DNA and results for over 200 angiosperms. *American Journal of Botany* 75: 1443-1458.
- Cosmides LM, Tooby J (1981) Cytoplasmic inheritance and intragenomic conflict. *Journal of Theoretical Biology* 89: 83-129.
- Couvet D, Ronce O, Gliddon C (1998) The maintenance of nucleocytoplasmic polymorphism in a metapopulation: the case of gynodioecy. *American Naturalist* 152: 59-70.
- Darwin C (1877) *The Different Forms of Flowers on Plants of the Same Species*. John Murray, London.

REFERENCES

- de Jong TJ, Batenburg FHD, van Dijk J (2002) Seed sex ratio in dioecious plants depends on relative dispersal of pollen and seeds: an example using a chessboard simulation model. *Journal of Evolutionary Biology* 15: 373-379.
- de Jong TJ, van der Meijden E (2004) Sex ratio of some long-lived dioecious plants in a sand dune area. *Plant Biology* 6: 616-620.
- de Jong TJ, Nell H, Glawe GA (2005) Heritable variation in seed sex ratio of the stinging nettle (*Urtica dioica*). *Plant Biology* 7: 190-194.
- de Jong TJ, Klinkhamer PGL (2005) *Evolutionary Ecology of Plant Reproductive Strategies*. Cambridge University Press, Cambridge.
- Delesalle VA, Muenchow GE (1992) Opportunities for selfing and inbreeding depression in *Sagittaria* congeners (Alismataceae) with contrasting sexual systems. *Evolutionary Trends in Plants* 6: 81-91.
- Dellaporta SL, Calderon-Urrea A (1993) Sex determination in flowering plants. *Plant Cell* 5: 1241-1251.
- Delph LF (1999) Sexual dimorphism in life history. In: Geber MA, Dawson TE, Delph LF (eds.) *Gender and Sexual Dimorphism in Flowering Plants*, Springer Verlag, Berlin, pp. 149-174.
- Desfeux C, Maurice S, Henry JP, Lejeune B, Gouyon PH (1996) Evolution of reproductive systems in the genus *Silene*. *Proceedings of the Royal Society London Series B* 263: 409-414.
- Dickison WC (1974) Palynological evidence. In: Radford AE et al. (eds.) *Vascular plant systematics*, Harper and Row Publishers, pp. 211-222.
- Donnison IS, Siroky J, Vyskot B, Saedler H, Grant S (1996) Isolation of the Y chromosome-specific sequences from *Silene latifolia* and of male sex determining genes using representational difference analysis. *Genetics* 144: 1891-1899.
- Dorken ME, Friedman J, Barrett SCH (2002) The evolution and maintenance of monoecy and dioecy in *Sagittaria latifolia* (Alismataceae). *Ecology* 56: 31-41.
- Dorken ME, Barrett SCH (2003) Sex determination and the evolution of dioecy from monoecy in *Sagittaria latifolia* (Alismataceae). *Proceedings of the Royal Society London Series B* 271: 213-219.
- Doust JL, Laporte G (1991) Population sex ratios, population mixtures and fecundity in a clonal macrophyte, *Vallisneria americana*. *Journal of Ecology* 79: 477-489.
- Durand B, Durand R (1991) Sex determination and reproductive organ differentiation in *Mercurialis*. *Plant Science* 80: 49-65.
- Ehlers BK, Maurice S, Batallion T (2005) Sex inheritance in gynodioecious species: a polygenic view. *Proceedings of the Royal Society London Series B* 272: 1795-1802.
- Eppley SM, Stanton ML, Grosberg RK (1998) Intrapopulation sex ratio variation in the salt grass *Distichlis spicata*. *American Naturalist* 152: 659-670.

REFERENCES

- Falconer DS, Mackay TFC (1996) Introduction to Quantitative Genetics. Longman, UK.
- Fisher RA (1930) The Genetical Theory of Natural Selection. Clarendon Press, Oxford.
- Frank SA, Barr CM (2001) Spatial dynamics of cytoplasmic male sterility. In: Silvertown J, Antonovics J (eds.) Integrating Ecology and Evolution in a Spatial Context, Blackwell Science, Oxford, pp. 219-243.
- Freeman DC, Harper KT, Charnov EL (1980) Sex change in plants: Old and new observations and new hypotheses. *Oecologia* 47: 222-232.
- Freeman DC, McArthur ED, Harper KT, Blauer AC (1981) Influence of environment on the floral sex ratio of monoecious plants. *Evolution* 35: 194-197.
- Freeman DC, Wachocki BA, Stender M J, Goldschlag DE, Michaels HJ (1994) Seed size and sex ratio in spinach: application of the Trivers-Willard hypothesis to plants. *Ecoscience* 1: 54-63.
- Gabay-Laughnan S, Chase CD, Ortega VM, Zhao LM (2004) Molecular-genetic characterization of CMS-S restorer-of-fertility alleles identified in Mexican maize and teosinte. *Genetics* 166: 959-970.
- Galán F (1951) Analyse génétique de la monoécie et de la dioécie et de leur différence dans *Ecballium elaterium*. *Acta Salmanticensia, Ciencias, Section Biología* 1: 7-15.
- Galli MG, Bracale M, Falavigna A, Raffaldi F, Savini C, Vigo A (1993) Different kinds of male flowers in the dioecious plant *Asparagus officinalis* L. *Sexual Plant Reproduction* 6: 16-21.
- Givnish TJ (1980) Ecological constraints on the evolution of breeding systems in seed plants: dioecy and dispersal in gymnosperms. *Evolution* 34: 959-972.
- Glawe GA, de Jong TJ (2005) Environmental conditions affect sex expression in monoecious, but not in male and female plants of *Urtica dioica*. *Sexual Plant Reproduction* 17: 253-260. [= Chapter 4]
- Gorelick R (2003) Evolution of dioecy and sex chromosomes via methylation driving Muller's ratchet. *Biological Journal of the Linnean Society* 80: 353-368.
- Gouyon PH, Vichot F, van Damme JMM (1991) Nuclear-cytoplasmic male sterility: single-point equilibria versus limit cycles. *American Naturalist* 137: 498-514.
- Grant SR (1999) Genetics of gender dimorphism in higher plants. In: Geber MA, Dawson TE, Delph LF (eds.) Gender and sexual dimorphism in flowering plants, Springer-Verlag Berlin Heidelberg, pp. 247-274.
- Greig-Smith P (1948) Biological flora of the British Isles. *Urtica*. *Journal of Ecology* 36: 339-355.

REFERENCES

- Hamilton WD (1967) Extraordinary sex ratios. *Science* 156: 477-488.
- Hardy ICW (ed.) (2002) Sex Ratios: Concepts and Research Methods. Cambridge University Press, Cambridge.
- Hartmann M (1956) Die Sexualität. 2nd edn. Fischer Verlag, Stuttgart.
- Harvey CF, Gill GP, Fraser LG, McNeilage MA (1997) Sex determination in *Actinidia*. 1. Sex-linked markers and progeny sex ratio in diploid *A. chinensis*. *Sexual Plant Reproduction* 10: 149-154.
- Heemskerk M, Oliehoek J, de Jong TJ (1998) Eenhuisigheid en sex-ratio bij de Grote brandnetel (*Urtica dioica* L.). *Gorteria* 24: 88-89.
- Heslop-Harrison J (1956) Auxin and sexuality in *Cannabis sativa*. *Physiologia Plantarum* 9: 588-597.
- Heslop-Harrison J (1957) The experimental modification of sex expression in flowering plants. *Biological Review* 32: 38-90.
- Hettwer U, Gerowitt B (2004) On sex ratios in field populations and progenies of *Cirsium arvense*. *Journal of Plant Diseases and Protection* 14: 161-167.
- Jablonka E (2004) The evolution of the peculiarities of the mammalian sex chromosomes: an epigenetic view. *BioEssays* 26: 1327-1332.
- Jaenike J (2001) Sex chromosome meiotic drive. *Annual Review of Ecology and Systematics* 32: 25-49.
- Janick J, Stevenson EC (1955) Genetics of the monoecious character in spinach. *Genetics* 40: 429-437.
- Kay QON, Stevens DP (1986) The frequency, distribution and reproductive biology of dioecious species in the native flora of Britain and Ireland. *Botanical Journal of the Linnean Society* 92: 39-64.
- Kitchingham S (1979) Sex ratios and seed production in *Urtica dioica*. Unpublished BSc Thesis. Cited in: Kay QON, Stevens DP (1986) The frequency, distribution and reproductive biology of dioecious species in the native flora of Britain and Ireland. *Botanical Journal of the Linnean Society* 92: 39-64.
- Koelewijn HP, van Damme JMM (1995) Genetics of male sterility in gynodioecious *Plantago coronopus*. I. Cytoplasmic variation. *Genetics* 139: 1749-1758.
- Korbecka G, Klinkhamer PGL, Vrieling K (2002) Selective embryo abortion hypothesis revisited: a molecular approach. *Plant Biology* 4: 298-310.
- Korpelainen H (1991) Sex ratio variation and spatial segregation in populations of *Rumex acetosa* and *R. acetosella* (Polygonaceae). *Plant Systematics and Evolution* 174: 183-195.
- Korpelainen H (1992) Patterns of resource allocation in male and female plants of *Rumex acetosa* and *Rumex acetosella*. *Oecologia* 89: 133-139.
- Korpelainen H (1998) Labile sex expression in plants. *Biological Review* 73: 157-180.

REFERENCES

- Koskela T (2002) Variation in life-history traits among *Urtica dioica* populations with different history in parasitism by the holoparasitic plant *Cuscuta europaea*. *Evolutionary Ecology* 16: 433-454.
- Kuhn E (1939) Selbstbestäubungen subdiözischer Blütenpflanzen, ein neuer Beweis für die genetische Theorie der Geschlechtsbestimmung. *Planta* 30: 457-470.
- Kuiper PJC, Bos M (1992) *Plantago*: A Multidisciplinary Study. Ecological Studies No. 89, Springer Verlag, Berlin.
- Leshem Y, Oplin D (1977) Differences in endogenous levels of giberrellin activity in male and female partners of two dioecious tree species. *Annals of Botany* 41: 375-379.
- Lewis D (1942) The evolution of sex in flowering plants. *Biological Review* 17: 46-67.
- Lloyd DG, Webb CJ (1977) Secondary sex characters in plants. *Botanical Review* 43: 177-216.
- Lloyd DG (1981) The distribution of sex in *Myrica gale*. *Plant Systematics and Evolution* 138: 29-45.
- Louis JP, Durand B (1978) Studies with the dioecious angiosperm *Mercurialis annua* L. ($2n=16$): correlation between genic and cytoplasmic male sterility, sex segregation and feminizing hormones (cytokinins). *Molecular and General Genetics* 165: 309-322.
- Louis JP (1989) Genes for regulation of sex differentiation and male fertility in *Mercurialis annua*. *Journal of Heredity* 80: 104-111.
- Lynch M, Walsh B (1998) Genetics and analysis of quantitative traits. 1st edn. Sinauer Associates Inc., Massachusetts, USA.
- Lyttle TW, Wu C-I, Hawley RS (1993) Molecular analysis of insect meiosis and sex ratio distortion, pp. 357-406. In: Oakeshott J, Whitten MJ (eds.) *Molecular Approaches to Fundamental and Applied Entomology*, Springer Verlag, New York, USA.
- Machon N, Deletreleboulch V, Rameau C (1995) Quantitative analysis of sexual dimorphism in *Asparagus*. *Canadian Journal of Botany* 73: 1780-1786.
- Mandolino G, Carboni A, Forapani S, Faeti V, Ranalli P (1999) Identification of DNA markers linked to the male sex in dioecious hemp (*Cannabis sativa* L.). *Theoretical and Applied Genetics* 98: 86-92.
- Mather K (1949) Genetics of dioecy and monoecy in *Ecballium*. *Nature* 163: 926.
- Matsunaga S, Kawano S (2001) Sex determination by sex chromosomes in dioecious plants. *Plant Biology* 3: 481-488.
- McArthur ED (1977) Environmentally induced changes of sex expression in *Atriplex canescens*. *Heredity* 38: 97-103.
- McArthur ED (1992) Are trioeey and sexual lability in *Atriplex canescens* genetically based?: evidence from clonal studies. *Evolution* 46: 1708-1721.

REFERENCES

- McCauley DE, Taylor DR (1997) Local population structure and sex ratio: evolution in gynodioecious plants. *American Naturalist* 150: 406-419.
- McKey D (1975). The ecology of co-evolved seed dispersal. In: Gilbert LG, Raven PH (eds.) *Coevolution of Animals and Plants*, Texas University Press, pp 159-191.
- Meagher TR (1981) Population biology of *Chamaelirium luteum*, a dioecious lily. II. Mechanisms governing sex ratios. *Evolution* 35: 557-567.
- Meagher TR (1988) Sex determination in plants. In: Lovett J, Lovett Doust L (eds.) *Plant Reproductive Ecology: Patterns and Strategies* Oxford University Press, New York, pp.125-138.
- Meurman O (1925) The chromosome behaviour of some dioecious plants and their relatives with special reference to the sex chromosomes. *Societas Scientiarum Fennica* 2: 1-104.
- Mowforth (1986) Variation in nuclear DNA amounts in flowering plants: an ecological analysis. Ph.D. Thesis, University of Sheffield, UK.
- Mulcahy DL, Weeden NF, Kesseli R, Carroll SB (1992) DNA probes for the Y-chromosome of *Silene latifolia*, a dioecious angiosperm. *Sexual Plant Reproduction* 5: 86-88.
- Muller HJ (1964) The relation of recombination to mutation advance. *Mutation Research* 1: 2-9.
- Mutikainen P, Koskela T (2002) Population structure of a parasitic plant and its perennial host. *Heredity* 89: 318-324.
- Mutikainen P, Walls M, Ojala A (1994) Sexual differences in responses to stimulated herbivory in *Urtica dioica*. *Oikos* 69: 397-404.
- Nager RG, Monaghan P, Griffiths R, Houston DC, Dawson R (1999) Experimental demonstration that offspring sex ratio varies with maternal condition. *Proceedings of the National Academy of Sciences USA* 96: 570-573.
- Nur U, Werren JH, Eickbush DG, Burke WD, Eickbush TH (1988) A selfish B chromosome that enhances its transmission by eliminating the paternal genome. *Science* 240: 512-514.
- O'Neil SL, Hoffmann AA, Werren JH (1997) Influential Passengers: Inherited Microorganisms and Arthropod reproduction. University Press, Oxford.
- Obeso JR (2002) The costs of reproduction in plants. *New Phytologist* 155: 321-348.
- Oesau A (1998) Untersuchungen zur generativen Propagation der Acker-Kratzdistel (*Cirsium arvense*). *Zeitschrift für Pflanzenkrankheiten und Pflanzenschutz* 14: 75-82.
- Parker JS (1990) Sex chromosomes and sexual differentiation in flowering plants. *Chromosomes Today* 10: 187-198.

REFERENCES

- Pijnacker LP, Ferwerda MA (1984) Giemsa C-banding of potato chromosomes. Canadian Journal of Genetics and Cytology 26: 414-419.
- Premoli MC, Sella G, Berra GP (1995) Heritable variation of sex ratio in a polychaete worm. Journal of Evolutionary Biology 9: 845-854.
- Pollard AJ, Briggs D (1984) Genecological studies of *Urtica dioica* L. II. Patterns of variation at Wicken Fen, Cambridgeshire, England. New Phytologist 96: 483-499.
- Polley A, Seigner E, Ganal MW (1997) Identification of sex in hop (*Humulus lupus*) using molecular markers. Genome 40: 357-361.
- Purrrington CB (1993) Parental effects on progeny sex ratio, emergence, and flowering in *Silene latifolia* (Caryophyllaceae). Journal of Ecology 81: 807-811.
- Putwain PD, Harper JL (1972) Studies on the dynamics of plant populations: V. Mechanisms governing the sex ratio in *Rumex acetosa* and *R. acetosella*. Journal of Ecology 60: 113-1129.
- Renner SS, Ricklefs RE (1995) Dioecy and its correlates in the flowering plants. American Journal of Botany 82: 596-606.
- Rick CM, Hanna GC (1943) Determination of sex in *Asparagus officinalis* L. American Journal of Botany 30: 711-714.
- Rosnitschek-Schimmel I (1983) Biomass and nitrogen partitioning in a perennial and an annual nitrophilic species of *Urtica*. Zeitschrift für Pflanzenphysiologie 130: 215-225.
- Rottenberg A (2000) Fertility of exceptional bisexual individuals in four dioecious plant species. Sexual Plant Reproduction 12: 219-221.
- Rychlewski J, Zarzycki K (1975) Sex ratio in seeds of *Rumex acetosa* L. as a result of sparse or abundant pollination. Acta Biologica Cracov Series Botanica 18: 101-114.
- Saumitou-Laprade P, Cuguen J, Vernet P (1994) Cytoplasmic male sterility in plants: molecular evidence and the nucleocytoplasmic conflict. Trends in Ecology and Evolution 9: 431-435.
- Sanders LC, Lord EM (1989) Directed movement of latex particles in the gynoecia of three flowering plants. Science 243: 1606-1608.
- Sandler L, Novitski E (1957) Meiotic drive as an evolutionary force. American Naturalist 61: 105-110.
- Saur MJ, Wade MJ (2003) A synthetic review of the evolution of gynodioecy. American Naturalist 16: 837-851.
- Seal AG, McNeilage MA (1989) Sex and kiwifruit breeding. Acta Hortica 240: 35-38.
- Semerikov V, Lagercrantz U, Tsarouhas V, Rönnberg-Wästljung A, Alström-Rapaport C, Lascoux M (2003) Genetic mapping of sex-linked markers in *Salix viminalis* L. Heredity 91: 293-299.
- Shaw RE, Mohler JD (1953) The selective significance of the sex ratio. American Naturalist 87: 337-342.

REFERENCES

- Siegel S, Castellan NJ Jr (1988) Non-parametric Statistics for the Behavioral Sciences. McGraw-Hill, New York, USA.
- Silver LM (1993) The peculiar journey of a selfish chromosome: mouse t-haplotypes and meiotic drive. *Trends in Genetics* 9: 250-254.
- Sitte P, Ziegler H, Ehrendorfer F, Bresinsky A (1998) Strasburger, Lehrbuch der Botanik. Spektrum Akademischer Verlag Heidelberg, Berlin.
- Sokal RR, Rohlf FJ (1998) Biometry: The Principles and Practice of Statistics in Biological Research. WH Freeman, New York, USA.
- Soltis PS, Soltis DE, Wolf PG, Nickrent DL, Chaw S-M, Chapman RL (1999) The phylogeny of land plants inferred from 18S rRNA sequences: pushing the limits of rDNA signal? *Molecular Biology and Evolution* 16: 1774-1784.
- Šrůtek M, Teckelmann M (1998) Review of biology and ecology of *Urtica dioica*. *Preslia Praha* 70: 1-19.
- Stehlik I, Barrett SCH (2005) Mechanisms governing sex-ratio variation in dioecious *Rumex nivalis*. *Evolution* 59: 814-825.
- Steiner AA (1968) Soilless culture. In: International Potash Institute (eds.), The fertilization of potted crops. Proceedings of the 6th Colloquium of the International Potash Institute, Berne, Switzerland.
- Strasburger E (1910) Sexuelle und apogame Fortpflanzung bei Urticaceen. *Jahrbuch der Wissenschaftlichen Botanik* 47: 245-288.
- Stutz HC, Melby JM, Livingston GK (1975) Evolutionary studies of *Atriplex*: a relic gigas diploid population of *Atriplex canescens*. *American Journal of Botany* 62: 36-245.
- Taylor PD (1994) Sex ratio in a stepping stone population with sex-specific dispersal. *Theoretical Population Biology* 45: 203-218.
- Taylor DR (1993) Sex ratio in hybrids between *Silene alba* and *Silene dioica*: evidence for Y-linked restorers. *Heredity* 74: 518-526.
- Taylor DR (1994) The genetic basis of sex ratio in *Silene alba* (=*S. latifolia*). *Genetics* 136: 641-651.
- Taylor DR (1996) Parental expenditure and offspring sex ratios in the dioecious plant *Silene alba* (=*Silene latifolia*). *American Naturalist* 147: 870-879.
- Taylor DR (1999) Genetics of sex ratio variation among natural populations of a dioecious plant. *Evolution* 53: 55-62.
- Taylor DR, Saur MJ, Adams E (1999) Pollen performance and sex-ratio evolution in a dioecious plant. *Evolution* 53: 203-218.
- Taylor DR, Ingvarsson PK (2003) Common features of segregation distortion in plants and animals. *Genetica* 117: 27-35.
- Testolin R, Cipriani G, Costa G (1995) Sex segregation ratio and gender expression in the genus *Actinidia*. *Sexual Plant Reproduction* 8: 129-132.

REFERENCES

- Thompson JD, Manicacci D, Tarayre M (1998) Thirty-five years of thyme: a tale of two polymorphisms. *BioScience* 48: 805-815.
- Trivers RL, Willard DE (1973) Natural selection of parental ability to vary the sex ratio of offspring. *Science* 179: 90-92.
- Uneo S, Kadono Y (2001) Monoecious plants of *Myriophyllum ussuriense* (Regel) Maxim. in Japan. *Journal of Plant Research* 114: 375-376.
- Uyenoyama MK, Feldman M (1978) The genetics of sex ratio distortion by cytoplasmic infection under maternal and contagious transmission: an epidemiological study. *Theoretical Population Biology* 14: 471-479.
- Uyenoyama MK, Bengtsson BO (1982) Towards a genetic theory for the evolution of the sex ratio. III Parental and sibling control of brood investment ratio under partial sib-mating. *Theoretical Population Biology* 22: 43-68.
- Vamosi JC, Otto SP, Barrett SCH (2003) Phylogenetic analysis of the ecological correlates of dioecy in angiosperms. *Journal of Evolutionary Biology* 16: 1006-1018.
- van Damme JMM (1991) A restorer gene in gynodioecious *Plantago coronopus* subject to selection in the gametophytic and seedling stage. *Heredity* 66: 19-27.
- van Nigtevecht G (1966) Genetic studies in the dioecious *Melandrium*. II. Sex determination in *Melandrium album* and *Melandrium dioicum*. *Genetica* 239: 307-344.
- Vekemans X, Hardy O (2002) New insights from spatial genetic structure analyses in plant populations. *Molecular Ecology* 13: 921-935.
- Waldron J, Peace CP, Searle IR, Furtado A, Wade N, Graham MW, Carroll BJ (2002) Randomly Amplified DNA Fingerprinting: A culmination of DNA marker technologies based on arbitrarily-primed PCR amplification. *Journal of Biomedicine and Biotechnology* 2: 141-150.
- Webb CJ (1992) Sex ratios from seed in six families of *Scandia geniculata* (Apiaceae). *New Zealand Journal of Botany* 30: 401-404.
- Weeks AR, Reynolds KT, Hoffmann AA (2002) *Wolbachia* dynamics and host effects: what has (and has not) been demonstrated? *Trends in Ecology and Evolution* 17: 257-262.
- Weller SG, Wagner WL, Sakai AK (1995) A phylogenetic analysis of *Schiedea* and *Alsinidendron* (Caryophyllaceae: Alsinoideae): implications for the evolution of breeding systems. *Systematic Botany* 20: 315-337.
- Werren JH, Beukeboom LW (1998) Sex determination, sex ratios, and genetic conflict. *Annual Review of Ecology and Systematics* 29: 233-261.
- Werren JH, Hatcher MJ, Godfray HCJ (2002) Maternal-offspring conflict leads to the evolution of dominant zygotic sex determination. *Heredity* 88: 102-111.

REFERENCES

- West SA, Reece SE, Sheldon BC (2002) Sex ratios. *Heredity* 88: 117-124.
- Westergaard M (1958) The mechanism of sex determination in flowering plants. *Advances in Genetics* 9: 217-281.
- Wiley DN, Clapham PJ (1993) Does maternal condition affect sex ratio of offspring in humpback whales? *Animal Behaviour* 46: 321-324.
- Wolf DE, Satkoski JA, White K, Rieseberg LH (2001) Sex determination in the androdioecious plant *Datisca glomerata* and its dioecious sister species *D. cannabina*. *Genetics* 159: 1243-1257.
- Wolfe LM, Shmida A (1995) Regulation of gender and flowering behaviour in a sexually dimorphic desert shrub (*Ochradenus baccatus* Delile [Resedaceae]). *Israel Journal of Plant Science* 43: 325-337.
- Yamashita N, Abe T (2002) Size distribution, growth and inter-year variation in sex expression of *Bischofia javanica*, an invasive tree. *Annals of Botany* 90: 599-605.
- Yampolsky C, Yampolsky H (1922) Distribution of sex forms in the phanerogamic flora. *Bibliotheca Genetica* 3: 1-62.
- Zangh Q, Liu Y, Sodmergen (2003) Examination of the cytoplasmic DNA in malereproductive cells to determine the potential for cytoplasmic inheritance in 295 angiosperm species. *Plant Cell Physiology* 44: 941-951.