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## Gonochorism



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### Synonyms

[Dioecy](#); [Gonochory](#); [Unisexualism](#)

### Definition

Gonochorism is the condition of individual organisms within a species existing as one of two possible sexes, specifically male or female. Gonochorism includes distinct sex-specific reproductive strategies among sexual reproducing taxa.

### Sex in the Animal Kingdom

Within the kingdom Animalia, sexual reproduction is the norm, and asexual reproduction appears as a rare exception, and usually not in exclusion, to sexual reproduction (Awise 2008; Schön et al. 2009). Gonochorism is likewise characteristic of the vast majority of animal species (Jarne and Auld 2006) and is almost ubiquitous among vertebrates, with the largest variations occurring among marine organisms, especially teleost fish (e.g., Kobayashi et al. 2013). Compared to

asexual reproduction, sexual reproduction necessitates the combination of gametes from two different individuals. In all known animal taxa, sexual reproduction occurs through the combination of heterogenous gametes that differ in size and shape, a condition known as anisogamy (see Kumar et al. 2019). Indeed, anisogamy appears to be common because of the costs associated with isogamy, in which gametes of all individuals are of similar size and shape (Matsuda and Abrams 1999).

The size of the gametes is the most direct means of differentiating between sexes. By definition, male gametes are smaller, and female gametes are larger (see Verma 2019). Individuals producing smaller gametes are defined as males, and individuals producing larger gametes are defined as female. Sex determination mechanisms are more stable among mammals and birds and far more variable among many marine taxa, with genes, environment, and epigenetics determining and reversing sex across numerous gonochoristic fish species (see Baroiller and D’Cotta 2016). However, it should be noted that male and female sex are more usefully defined by reproductive strategy, rather than by immutable physiological characteristics (Schärer 2017). In this way, males and females occupy distinct reproductive niches that reflect the combination of their asymmetrical gametes and results in a cascade of sex differences, such as in morphology and behavior (see Eberhard 1996; Trivers 1972).

Gonochorism can be contrasted to simultaneous hermaphroditism, which is the capacity of an individual to reproduce using either male or female gametes within its lifetime (see Rosenfield 2018). Not infrequently within simultaneous hermaphroditic species, such as marine flatworms (*Pseudoceros bifurcus*; Michiels and Newman 1998), individuals may preferentially attempt to reproduce using less costly male gametes and attempt to avoid reproducing using more costly female gametes (Michiels and Koene 2006). These species are not considered gonochoristic even though they demonstrate a preferred sex-specific reproductive strategy, because they maintain the capacity to reproduce using male or female gametes. Sequential hermaphroditism also is a separate reproductive strategy from gonochorism, although there is some overlap such that it may be unclear whether a species is gonochoristic or sequentially hermaphroditic (e.g., *Patella ferruginea*; Espinosa et al. 2009). For sequential hermaphroditic species, individuals may change sex across the lifespan but only conserve one sex-specific reproductive capability at a time. For example, an individual of a protogynous species, such as the rock wrasse (*Halichoeres semicinctus*; Adreani and Allen 2008) may begin life producing exclusively female gametes but may undergo a transformation later in life after which it will only produce male gametes. In these cases, the individuals may appear to be gonochoristic, but because it is possible for a female to develop a male reproductive capacity, such taxa are distinct from gonochorism. Gonochorism conveys distinct benefits compared to hermaphroditism and asexual reproduction, which likely have acted as selection pressures favoring the reproductive strategy, but more data are needed to specify the evolutionary trajectory of gonochorism in the animal kingdom (Sasson and Ryan 2017).

## Cross-References

- ▶ Anisogamy
- ▶ Asexual Reproduction
- ▶ Gametes

- ▶ Hermaphrodite
- ▶ Protandrous Hermaphroditism
- ▶ Protogynous Hermaphroditism
- ▶ Reproduction
- ▶ Sex Role Reversal
- ▶ Sex-Linked
- ▶ Sexual Dimorphism

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