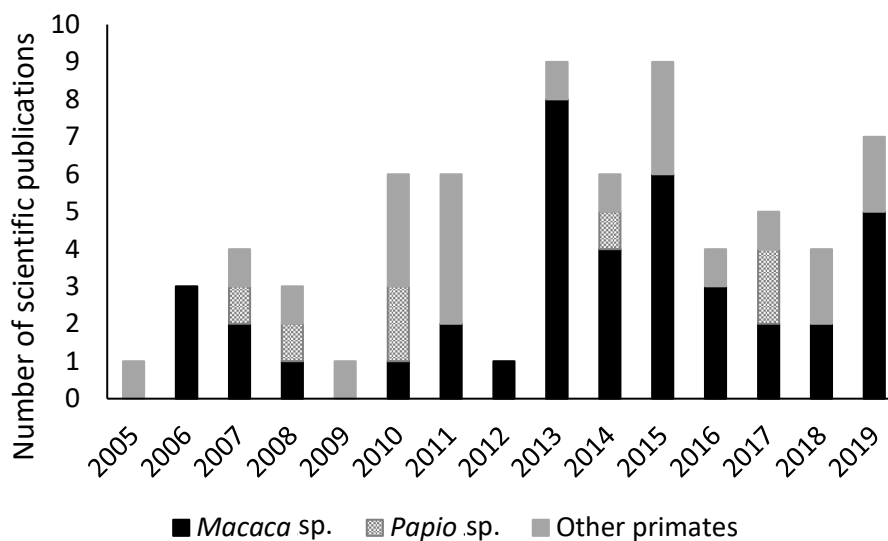


24 'commensalism' resurged following Paterson and Wallis' (2005) efforts to avoid the negative
25 implications of terms such as 'pest' or 'weed' species.

26 While commensalism is commonly used for describing human-primate relationships,
27 particularly for *Macaca* and *Papio* species (68%, Figure 1), only 8 papers in our literature
28 review (12%) defined their use of commensalism. Two of these papers acknowledge the
29 biological definition of 'commensalism' as described above, but note that in primatology the
30 term is used more broadly to mean primates living in close proximity to humans, or those
31 using anthropogenic landscapes and resources. All other papers which defined
32 'commensalism' used this definition, after Gautier and Biquand (1994), mirroring the way
33 the term was used by authors who did not offer a definition.



34

35 Figure 1: Number of scientific papers published in peer-reviewed journals using the term
36 'commensal' between 2005-2019. Papers were searched via Google Scholar using the terms
37 'primate' and 'commensal'. We chose 2005 as the starting date based on the publication
38 date of Paterson and Wallis' definition of 'commensal primates'. We included peer
39 reviewed articles and book chapters, but omitted abstracts, theses, and encyclopaedia

40 entries. All relevant papers were read for the use of 'commensalism' in this context; those
41 that used the term were then checked for (a) whether (and how) commensalism was
42 defined by the authors, (b) what taxonomic groups were discussed, and (c) whether the
43 paper reported specific positive or negative outcomes of the human-primate relationship.

44

45 Using 'commensalism' imprecisely may lead readers to think that human-primate
46 relationships have a clear, one-way benefit, obscuring potentially important risks to either
47 humans or animals. This may have unintended consequences on the relationships between
48 local communities and primates, potentially increasing resentment towards primates and
49 undermining conservation efforts. However, of 69 studies published in 2005-2019 using the
50 term 'commensal', roughly half (37 or 54%) highlighted negative effects for either the
51 humans or the primate species involved, increasing confusion around what the authors
52 mean about the term 'commensal'. Finally, commensalism does not specifically refer to
53 dietary benefits, but an array of benefits such as shelter or support against predators.
54 Therefore, using the term 'commensal' only for dietary benefits conferred by humans
55 diminishes our understanding of the relationships between humans and primates.

56

57 **Can non-human primates ever be considered commensal with humans?**

58 The categorisation of human and primate relationships is complex. Some primate
59 populations have multilevel interactions with humans, which include a multitude of foraging
60 resources, human users, and environments involved. The following factors should be taken

61 into consideration when determining whether a primate population can be called
62 'commensal':

63 1) Foraging resources (if applicable)

64 Feeding on human-sourced food can be considered as costly, commensal or mutually
65 beneficial. For instance, while some people tolerate crop-foraging by primates (Riley and
66 Priston 2010), others would consider it as damage or competition. Similarly, provisioning
67 can provide some benefits to humans, such as improved well-being, but can also be costly
68 due to aggression or pathogen transmission. Therefore, we suggest that primates be
69 considered commensal to humans only when they feed on discarded human food, and
70 when we have demonstrated that it does not present any direct or indirect costs for human
71 users.

72 2) Sustainable relationship

73 Commensalism must be recognised as a sustained relationship, and it cannot be defined by
74 one species gaining short-term benefits from another. For example, provisioned wildlife
75 may gain easy nutrients in the short-term, but run a higher risk of pathogen transmission,
76 human-animal aggression, or dietary imbalance in the long-term, so that the benefits are
77 short-lived. Therefore, evidence of a commensal relationship must be sustained over at
78 least two generations to consider the potential long-term changes associated with this
79 interspecies relationship.

80 3) Cost/benefit ratio evidence

81 For a primate population to be called 'commensal' in relation to humans, the cost/benefit
82 ratio of the relationship, in the short and long-term, must be assessed. However, to date,

83 little is known about potential costs and benefits that humans, and living in anthropogenic
84 landscapes, might provide for wild primates. Therefore, more research is needed to better
85 understand the cost/benefit ratio of relationships between humans, primates and their
86 shared environments, so that we can reassess whether the term 'commensal' could ever be
87 used to describe human-primate relationships.

88

89 **Conclusion**

90 Words matter. It is our duty as scholars to use the most accurate terminology available to
91 reduce confusion across disciplines, and it is imperative that we consider the unintended
92 consequences of our word choices. Therefore, we suggest that primatologists refrain from
93 using the term 'commensal' if not all criteria are met. Instead, we propose using more
94 neutral terms, depending on context, which would advance our understanding of those
95 human-primate dynamics.

96 • **Sympatric primates** – The term sympatric is defined as 'animal species or
97 populations occurring within the same or overlapping geographical areas' (Oxford
98 Dictionary 2015). Sympatric does not imply any specific relationship between the
99 two species, and makes no statement on provisioning, crop-foraging, or other shared
100 resources.

101

102 • **Provisioned primates** – This term describes a population of primates that use
103 human-sourced foods freely given to them by the humans.

104

- 105 • **Crop-foraging, human-sourced foraging, or urban-foraging primates** – These terms
106 are neutral and refer to foraging on agricultural plants or on human food found in
107 urban areas in the same way we would report other foraging strategies.

108

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