**Cultural and socio-demographic drivers shape seahorse uses in Malaysia: implications for conservation**

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Supplementary Material 1 Questionnaire used during surveys with members of the public and fishers. The questionnaire is available in a separate file in the Supplementary Materials section at [doi.org/10.1017/S0030605324000425](https://doi.org/10.1017/S0030605324000425).

Supplementary Table 1 Results of *χ*2 tests and Fisher’s exact tests using the weighted (raking technique) and unweighted samples related to the ethnic group, gender, and age variables. Using the Australian Bureau of Statistics sample size calculator and a confidence level of 95%, total adult population size of Malaysia (22.73 million; Statista Research Department, 2022), and proportion (0.5), the expected sample size was 385 individuals. As the proportions (referring to the estimated proportion of individuals with a specific attribute within a population; e.g. proportion of people who use seahorses) were not available in the literature, we generally assumed them to be 0.5. The proportions of different ethnic groups in the total population were taken into account (Malay 69.8%, Chinese 22.4%, Indian 6.8%, Others 1.0%; Department of Statistics Malaysia, 2021) to obtain the expected minimum sample size of each ethnic group.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency of seahorse use by ethnic group (unweighted) | Malay | Chinese | Indian | Indigenous/others | Overall |
| Yes | 202 | 43 | 4 | 1 | 250 |
| No | 488 | 257 | 118 | 76 | 939 |
| Total | 690 | 300 | 122 | 77 | 1189 |

Conclusion: Consumption of seahorses was related to ethnic background of the public and fisher respondents (*X*2 =77.56, *df* = 3, P < 0.05).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Frequency of seahorse use by ethnic group (weighted) | Malay | Chinese | Indian | Indigenous/others | Overall |
| Yes | 243 | 38 | 3 | 0 | 284 |
| No | 587 | 228 | 78 | 12 | 905 |
| Total | 830 | 266 | 81 | 12 | 1189 |

Conclusion: Consumption of seahorses was related to ethnic background of the public and fisher respondents (two-tailed P < 0.05).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency of seahorse use by gender (unweighted) | Male | Female | Both/prefer not to say | Overall |
| Yes | 225 | 25 | 0 | 250 |
| No | 539 | 389 | 11 | 939 |
| Total | 764 | 414 | 11 | 1189 |

Conclusion: Consumption of seahorses was related to gender of the public and fisher respondents (two-tailed P < 0.05).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency of seahorse use by gender (weighted) | Male | Female | Both/prefer not to say | Overall |
| Yes | 180 | 35 | NA (no proportion/ design weight for this category) | 215 |
| No | 431 | 543 | NA | 974 |
| Total | 611 | 578 | NA | 1189 |

Conclusion: Consumption of seahorses was related to gender of the public and fisher respondents (two-tailed P < 0.05).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Frequency of seahorse use by age (unweighted) | 18–30 | 31–40 | 41–50 | 51–60 | > 60 | Overall |
| Yes | 19 | 59 | 77 | 65 | 30 | 250 |
| No | 335 | 169 | 204 | 158 | 73 | 939 |
| Total | 354 | 228 | 281 | 223 | 103 | 1189 |

Conclusion: Consumption of seahorses was related to age of the public and fisher respondents (*X*2 =75.31, *df* = 4, P < 0.05).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Frequency of seahorse use by age (weighted) | 18–30 | 31–40 | 41–50 | 51–60 | > 60 | Overall |
| Yes | 44 | 214 | 277 | 241 | 26 | 752 |
| No | 783 | 613 | 601 | 586 | 62 | 2646 |
| Total | 828 | 828 | 828 | 828 | 88 | 3398 |

Conclusion: Consumption of seahorses was related to age of the public and fisher respondents (*X*2 =182.12, *df* = 4, P < 0.05).

Supplementary Table 2 Medicinal use types of seahorses among 112 respondents. Percentages represent the percentage of respondents by ethnic groups.

|  |  |  |
| --- | --- | --- |
| Medicinal use types | Ethnic groups | Medicinal uses |
| Internal treatments of symptoms and diseases    External treatments of symptoms and diseases  General wellbeing  Aphrodisiac properties | Malay (53.6%)  Chinese (23.2%)  Indian (0.9%)  Malaysian Siamese (0.9%)  Malay (16.1%)  Chinese (22.3%) and Indian (0.9%)  Malay (16.1%), Chinese (11.6%), Indian (0.9%), and Malaysian Siamese (0.9%)  Malay (3.6%), and Chinese (0.9%) | Treat asthma, breathlessness, impotence and infertility, abdominal pain, heatiness1, high cholesterol, back pain, joint pain, kidney disorders, internal wounds, vein problems, nerve problems, improve eyesight, warm up the body, and facilitate blood flow  Treat impotence and infertility, asthma, heatiness1, back pain, kidney disorders, facilitate blood-cleansing, and facilitate parturition  Facilitate parturition  Treat asthma and heatiness1  Treat skin conditions, sprained ankle, birth wounds  Treat skin conditions  Strengthen the body and increase and balance energy flow |

1Heatiness is a local concept of the human body condition based on food intake that causes a state where there is too much heat inside the body.

Supplementary Table 3 Direct quotes by respondents about the medicinal uses of seahorses. Some quotes were translated from the local language of Bahasa Malaysia to English.

|  |  |
| --- | --- |
| Direct quotes | Respondents |
| “I have seen seahorses in massage oil bottle.”  “I have seen seahorses being sold in TCM shops as traditional medicine.”  “Given to those who knows how to make seahorses into medicine (soak dried seahorses in coconut oil to apply on skin) and use it personally.”  “Consumed to treat asthma and strengthen body.”  “I make sea cucumber oil so sometimes I soak seahorses in it. Used to treat skin condition.”  “I use large-sized seahorses to cure wound through consumption. I dry and blend them into powder before mixing it with sea cucumbers. I also consume seahorses by frying and eating them like crackers.”  “I will fry the seahorse to consume. Elderly people believe that it can be consumed to treat skin conditions.”  “I fry seahorses to be consumed as medicine (back pain and vein problems).”  “I will fry and consume seahorse to warm up my body. Sometimes made into ointment as well.” | R75, Public  R466, Public  JR037, Fisher  PHG004, Fisher  PHG017, Fisher  EJR012, Fisher  EJR059, Fisher  KLT052, Fisher  EJR071, Fisher |

Supplementary Table 4 Other uses of seahorses among 164 respondents. Per cent values represent the percentage of respondents by ethnic groups.

|  |  |
| --- | --- |
| Other uses | Ethnic groups |
| As curio/souvenirs    Protect against evil spirits  Put a spell on someone  As pets in aquariums  For research and educational display material | Malay (81.7%), Chinese (3.0%), and Malaysian Siamese (0.6%)  Malay (20.1%) and Malaysian Siamese (0.6%)  Malay (0.6%)  Malay (3.0%), Chinese (2.4%), and Indian (0.6%)  Malay (2.4%) and Chinese (0.6%) |

**References**

Department of Statistics Malaysia (2021) *Current Population Estimates, Malaysia, 2021*. Department of Statistics Malaysia, Putrajaya, Malaysia. [dosm.gov.my/portal-main/release-content/current-population-estimates-malaysia-2021](https://www.dosm.gov.my/index.php/portal-main/release-content/current-population-estimates-malaysia-2021) [accessed 4 September 2024].

Statista Research Department (2022) *Number of Adults in Malaysia 2012-2021*. Statista, Hamburg, Germany. [statista.com/statistics/667521/number-of-adults-in-malaysia/#:~:text=In%202021%2C%20there%20were%20approximately,the%20age%20of%2018%20years](https://www.statista.com/statistics/667521/number-of-adults-in-malaysia/#:~:text=In%202021%2C%20there%20were%20approximately,the%20age%20of%2018%20years) [accessed 20 June 2023].