

# The Role of Non-Invasive Genetic Sampling in Wildlife Research

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## Introduction

Wildlife research has been indispensable for increasing our insight into ecosystem functioning as well as for designing effective conservation measures. Genetic and genomic analyses might be able to yield the same information on, e.g., population size, health, or diet composition as other wildlife research methods, and even provide additional data that would not be possible to obtain by alternative means. Moreover, if DNA is collected non-invasively, this technique has only minimal or no impact on animal welfare. Nevertheless, it remains unclear in which contexts is non-invasive genetic assessment better suited to provide the relevant data than alternative research methods that are not based on DNA analysis.

## Methods

The objective of this study was to review and compare the performance of non-invasive genetic assessment and other research methods across a wide range of different types of studies, animal species, and sources of non-invasively sampled genetic material. The research was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Three of the largest databases were used for identifying the relevant scientific literature:

- Web of Science (1900-2020)
- SCOPUS (1970-2020)
- Agricultural and Environmental Science Collection (1970-2020).

## EXAMPLES OF NON-INVASIVE GENETIC SAMPLING



saliva



faeces



spider web



mucus

## Results

In total, I was able to identify 113 studies that compared the performance of non-invasive genetic sampling and another approach. The majority of relevant studies (94%) reported that non-invasive genetic assessment showed equivalent or superior performance. It can perform better particularly in studies on population size estimation, species detection or species identification (Figure 1). Non-invasive genetic assessment might be also cheaper and more time-efficient than other methods.

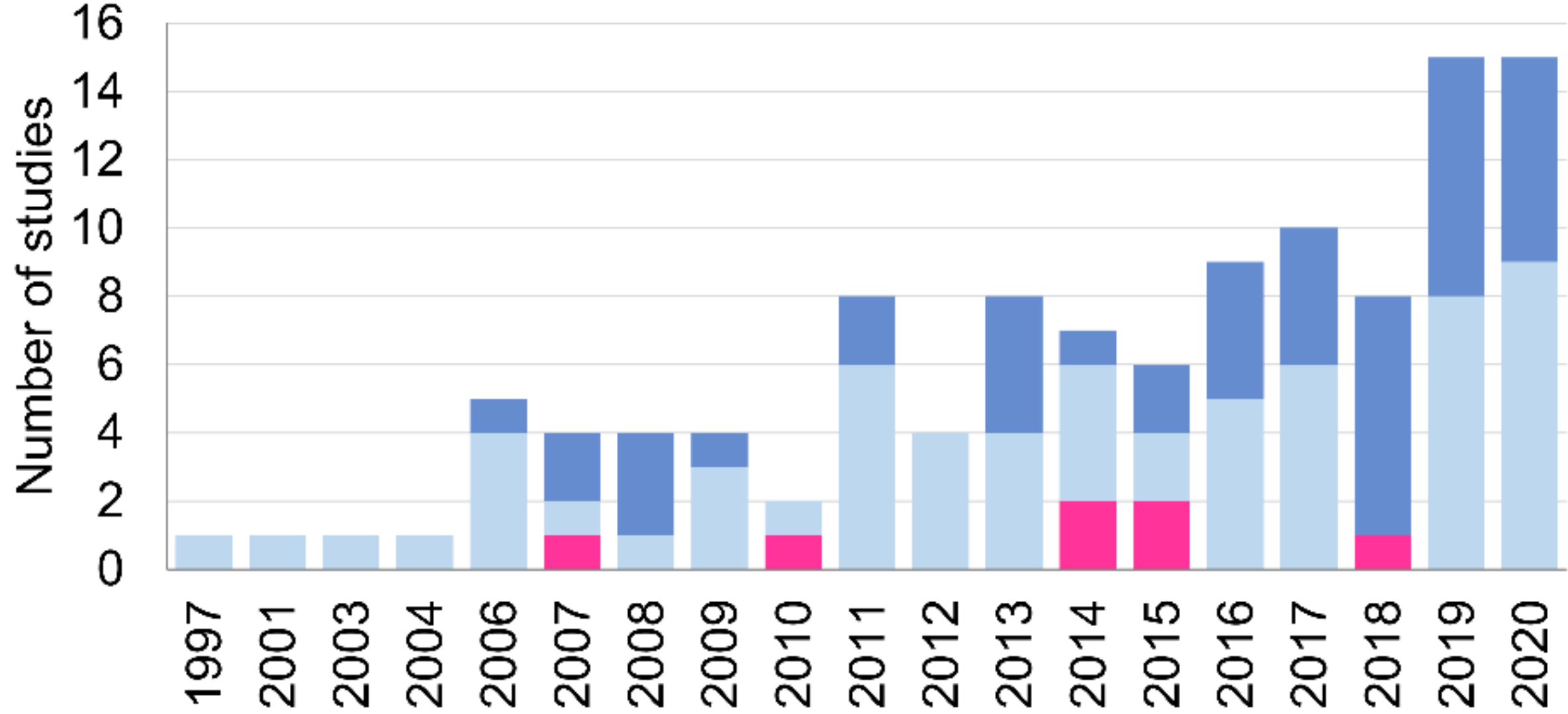
## Conclusions

In conclusion, non-invasive genetic assessment is a very effective research tool, suitable for a large spectrum of wildlife studies. The recent technological advances in genetic sampling and sequencing methods provide new opportunities for fast, reliable, and cost-efficient wildlife research. Moreover, non-invasive genetic assessment is well-suited to address the increasing demand for effective and efficient research that has minimal impact on animal welfare.

**PERFORMANCE OF NON-INVASIVE GENETIC ASSESSMENT**

- SUPERIOR
- EQUIVALENT
- INFERIOR

(A) YEAR OF PUBLICATION



(B) TYPE OF STUDY

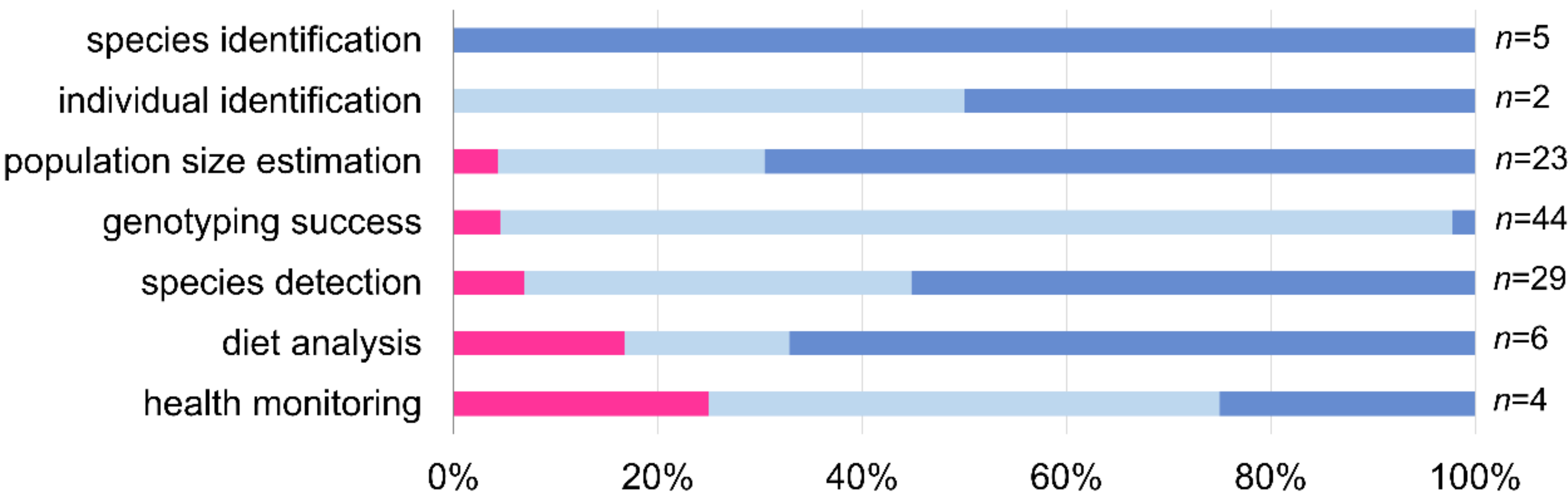
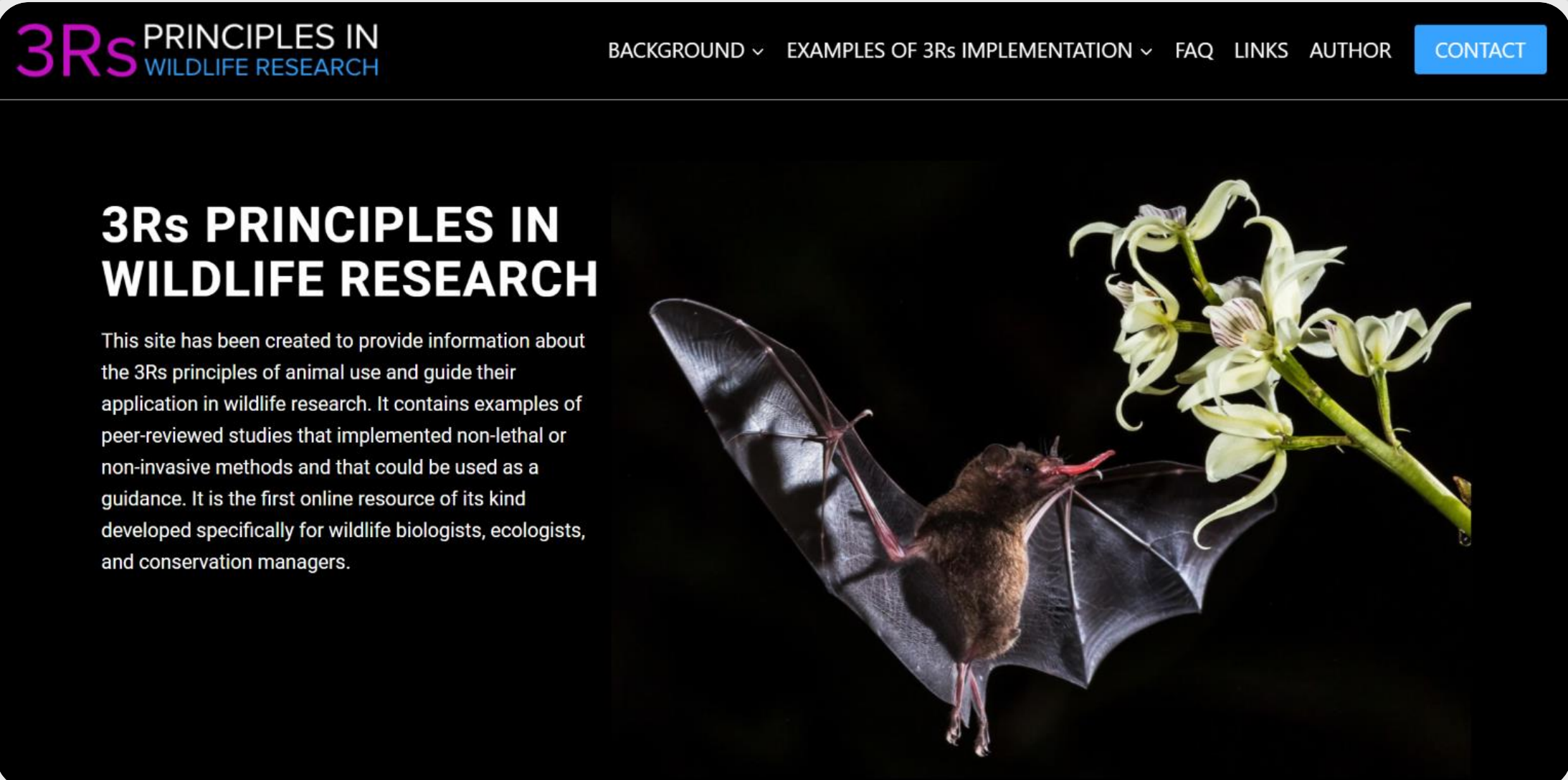


Figure 1: Performance of non-invasive genetic assessment in comparison with other method according to the year of publication (A) and the type of study (B).



## GUIDELINES

Informational website providing guidance on how to implement non-invasive genetic sampling and other non-invasive research methods in wildlife research is available at <https://3RsWildlife.info>. It contains examples of studies that either developed or implemented a non-invasive or non-lethal method for wildlife research. Apart from genetics, other categories currently available are diet analysis, individual identification, and physiology.