**Executive summary for “Potential highly variable catch efficiency estimates complicate estimation of abundance” by Delargy et al (2022) published in Fisheries Research.**

This research aimed to understand whether commercial fishing vessels, that target king scallops, catch at equivalent rates. Catch rates can be defined in a number of ways, and the definition studied here is called *catch efficiency* and is the fraction of scallops that a vessel catches from those that were in the area that was fished. A catch efficiency of 0.5 means half the scallops in the area fished were caught and half were not. This term is extremely similar to *catchability*; however, catchability is the fraction that were caught from the wider scallop population and is therefore typically a much smaller number. Catch efficiency is important because it can be used to estimate the number of scallops on the seafloor (i.e. those not caught). A wide range of factors including environmental conditions, fishing gear types and vessel operations, can affect catch efficiency.

Whether or not commercial vessels have different catch efficiencies is important for scientists that wish to charter multiple commercial vessels to carry out a scientific survey of scallop populations. Using multiple vessels for such a survey is often cost-effective and allows more fishers to engage with the scientific process. However, if the vessels have different catch efficiencies then their catch rates are not directly comparable. Assuming the catch efficiencies are the same would lead to erroneous estimates of the number of scallops on the seafloor.

The study used king scallop catch rate data from five commercial scallop vessels that were chartered for a scientific experiment in 2014. The fishing vessels repeatedly fished relatively small patches of the seabed. A general assumption when doing studies like this is that the catch rates of scallops will decline as more fishing is conducted, and this called *depletion*. This is because scallops are continually removed from the area, resulting in less available for capture during future hauls. This study applied a sophisticated *depletion estimator*, which is a statistical model designed to analyse this rate of decline in the catch rates. The model is then able to estimate the catch efficiency of each vessel so that they can be compared to each other.

The study found that two of the vessels had distinct catch efficiencies. This means that these vessels catch scallops at different rates and that different estimates of the number of scallops on the seafloor would be obtained. Therefore, understanding this difference in catch efficiencies avoids potential errors that could have arisen by assuming the vessels caught scallops at the same rate. The other vessels showed clear potential to also have different catch efficiencies; however, uncertainty in the model outputs prevented definitive differences being detected. In addition, the models were used to estimate the market-sized king scallop density in the experiment areas immediately prior to the experiment beginning. Lastly, the study conducted detailed examinations of a wide range of factors that could have driven the patterns in the results, but found no strong evidence. However, there was a suggestion that catch efficiency decreased with increasing water depth.

To verify the findings, the study also conducted extensive computer-based simulations of the data and model and these showed that the findings were robust and there was sufficient signal in the data.

Future study of variations in catch efficiency among fishing vessels is recommended to build on the work here, and technical suggestions are provided in the study.