

Fish Population Dynamics

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ASSESSMENT OF STOCKS IN TROPICAL WATERS

- The literature on fishery biology dealing with species in temperate zones is extensive compared to that on tropical fisheries. The major part of the literature on tropical fish stock assessment was published recently. As will appear in the following chapters of the manual, this can partly be attributed to the fact that tropical resources are somewhat more complex than those of temperate waters.



- For the analytical models we need the number of fish caught of each age group as input. In temperate waters stock assessment methods used are heavily dependent on the fortunate fact that ages of fish can be readily determined by "*ageing*" them. Ageing is most often done by counting rings in hard parts of the fish body, such as ear-bones (otoliths) or scales. The so-called year-rings are formed through a daily addition (daily-ring) to the size of the scale or otolith. The chemical composition and thereby the transparency of the addition depends (among other things) on the amount of food available and is therefore seasonal.

- The difference in deposits made in the winter and in the summer can be detected and one year-ring, composed of a summer and a winter part, can be distinguished from the next. Moreover, temperate fish species usually spawn once per year in a relatively short time-span, which makes it easy to distinguish year-classes or cohorts.
- Also in tropical fish material is added daily to hard parts, which can be distinguished as daily growth rings. However, the lack of a strong seasonality makes the distinction of seasonal rings and therefore also of year-rings problematic for many tropical species. Moreover, the same absence of strong seasons results in less distinct spawning periods for most species. Many tropical species spawn at least twice per year and often over long periods.

- Fortunately, due to periodic changes in winds (monsoons) and shifts in oceanographic conditions (upwelling) in many tropical areas, a certain level of seasonality can still be detected. This seasonality may be reflected in the spawning patterns and growth of tropical fish species albeit less pronounced and much more difficult to detect than in temperate waters. These seasonal differences make it possible to detect also in tropical species the existence of different cohorts (often two per year), through the analyses of length-frequency samples.

- In recent years, techniques have been developed to read daily rings in the otoliths of many fish species. This has enabled the development of age reading on tropical species, in particular of fish with short life spans, or young fish. These techniques are still very time consuming and will be difficult to apply on a routine basis. They may however, serve to validate the results obtained from the analyses of length-frequencies.

- A further complication of tropical fish stock assessment *vis-à-vis* that in temperate waters is that the number of species caught in some important gears, in particular the bottom trawl, is very high. This does not only affect sampling and data collection procedures, it also makes it more difficult to apply the models. For a further discussion of differences and similarities between exploited stocks in arctic, temperate and tropical waters, see Ursin (1984).
- The above-mentioned differences can easily explain the slow rate of development of fish stock assessment in the tropics compared to that in temperate areas. The present manual works with methods which are the length-based parallels to the traditional age-based methods of temperate waters.