In the doctoral dissertation, the results of the research conducted in the A$\sim$100 region above the closed neutron shell N=50 are presented, with particular emphasis on mechanisms of the emergence and the evolution of collectivity in this region. The current state of knowledge in this field is presented in the introduction to the work.

The main part of the thesis consists of two sections. In the first section, the results of β^- decay measurements and interpretation of neutron-rich nuclei ^{87}Se and ^{89}Se are presented. The Se nuclei were produced in proton induced fission of natural Th and separated with Penning trap at JYFL Jyväskylä. In the second section, the results of measurements of the ^{97}Mo(n$_{th}$,γ)^{98}Mo reaction using the FIPPS spectrometer at ILL Grenoble were presented and interpreted.

In the ^{87}Br nucleus, 51 new excited states and 114 new γ transitions were identified. The feeding of the ground state in the β^- decay was determined to be 23(5)%. Additionally, the experimental data confirmed the spin assignment of $5/2^-$ to the ground state of ^{87}Br. Furthermore, the existence of a low-lying excited state with energy of 6.02 keV was confirmed. In the β^- decay, the population of the $9/2^+$ state at 1463.89 keV was observed, identified as a single-particle $\pi g_{9/2}$ excitation. This state is likely an isomer with a half-life of about 20 ns. The observed excited states were interpreted in the context of the shell model and the anomalous coupling of single-particle structure with quadrupole collectivity.

In the neutron-rich nucleus ^{89}Br, populated in the β^- decay of ^{89}Se, excited states were identified for the first time. The existing scheme of excited states was extended by 12 new excited states and 31 new γ transitions. The spin-parity $(3/2^+)$ was proposed for the ground state of ^{89}Se, replacing the previous value of $(5/2^+)$. The observed Gamow-Teller decay to the $5/2^+$ state at 1754.5 keV suggests that the structure of this state is based on the single-particle $\pi g_{9/2}$ configuration. Additionally, candidates for single-particle, $\pi p_{3/2}$ and $\pi f_{5/2}$, excitations were proposed. The remaining excited states were interpreted in the context of the anomalous coupling.

The results obtained for ^{87}Br and ^{89}Br were interpreted in the broader context of N=50, N=52, and N=54 systematics and compared with theoretical calculations using the LSSM model to gain a better insight into the structure of the observed states. The calculations correctly reproduced the positions of the majority of experimentally observed excited states. Particular emphasis was placed on reproducing the position of the $\pi g_{9/2}$ orbital and its corresponding $9/2^+$ state. These states provide information about the key energy of the $\pi g_{9/2}$ shell relative to the closed, major Z=28 shell.

The part of the work concerning the ^{97}Mo(n$_{th}$,γ)^{98}Mo measurement discusses in detail the data analysis procedures, including energy and efficiency calibration. The measurement technique of angular correlations and linear polarization using clover detectors was also presented.

The analysis of the collected data allowed the identification of a total of 148 excited states and 712 γ transitions in the nucleus ^{98}Mo. Measurements of angular correlations and linear polarization allowed verifying the spins and parities of the excited states. The obtained results were interpreted in the context of collective evolution in N=56 isotones. Special attention was given to the ̈catalyticp̈roperties of proton orbitals, providing additional protons near the Fermi energy. It was proposed that these additional protons are transferred to the deformed $\pi g_{9/2}$ orbitals, simultaneously generating 0^+ excited states. The observed 0^+_1 and 0^+_2 excited states show some degree of collectivity, likely resulting from the mixing of higher-lying 0^+ excited states. Additionally, the 0_2^+ excited state in ^{98}Mo likely exhibits some $9/2^+$ configuration.

The large number of active orbitals near the Fermi energy explains the increased level density observed in ^{98}Mo and ^{100}Ru nuclei. The numerous 2^+ and 4^+ excited states, observed at an excitation energy of around 3 MeV are most likely the result of single-particle excitations, similarly to the structure of the 2_1^+ states in the A$\sim$100 region. The new effect in ^{98}Mo is the *proto-*γ band based on the 2_2^+ excited state at 1432.28 keV. This structure results from the mixing of the 2^+ and 4^+ excited states present at an energy of about 3 MeV and evolves into γ bands as the number of neutrons increases. Additional studies, particularly theoretical calculations, are required to verify this hypothesis.

Due to their simple neutron structure the N=56 isotones, especially the nucleus ^{98}Mo, are an excellent place for investigating the role of single-particle excitations in the emergence and evolution of collective effects in this region with the increasing number of protons in the $\pi g_{9/2}$ shell. As shown in the thesis, this shell becomes active already at Z=35. However, in Br isotopes there is a single proton on this shell and the excitations observed there have a single-particle character. It is only above Z=40, when the occupation of the $\pi g_{9/2}$ shell increases, that collective effects appear.

Various mechanisms for the formation of collective effects were proposed in the doctoral dissertation. However, they require confirmation in other experimental studies and theoretical calculations. An example of this is the limited information about the excited states above 4 MeV in the ^{100}Ru$_{56}$ nucleus. Furthermore, many excited states identified above 2.5 MeV do not have unambiguously assigned spins and parities.